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EDITORIAL NOTES.

An Independent Case for the Sulphate of Ammonia Association.

TAKING account of the circumstances, there is found in Messrs. Bradbury and Hirsch's review of the market for sulphate of ammonia during 1914, reasons both for congratulation and disappointment. There is cause for congratulation that things have not been worse than they are taking the average of the year, but disappointment that the healthy market values that reigned during the previous three years (more particularly those for the year 1912) have come to an end, and that, at the moment, there are no factors in the situation to encourage any expectation of a return to those prices other than a very remote possibility of their temporary realization if the war is of long duration. We sympathize with the difficulty experienced by the reporters in giving completeness to their review on this occasion, owing to the absence of statistics from the Continent since the outbreak of war. In our opinion, however, Messrs. Bradbury and Hirsch have in this report done a great service to the gas industry by, without deliberate intent, putting forward as strong a case as we have yet seen for the organization of British producers of sulphate of ammonia instead of producers ineffectually (as events have proved) trying to pursue their own independent course, and therefore a strong case for alliance with the Sulphate of Ammonia Association. If the bulk of our trade in sulphate of ammonia was done in the United Kingdom, there would be less need to press the point, and less need for the Association. But, unavoidably, the bulk of our trade is done overseas; and this trade has been brought under strong competition, and, directly the seas are free to Germany again, the competition will reopen with increased vigour.

Let us see what happened prior to the war, and what has happened since the war started. Readers may then draw their own deductions as to what will occur after the war, and as to whether British producers of sulphate of ammonia will not be the stronger in the competition by being united in an organization prepared to bring the best forces available to bear on the competition and the conditions prevailing at any time hereafter. We have to go back to the beginning of the present serious break in prices. This may be taken to date from November, 1913. Then the German Sulphate Syndicate substantially lowered prices for home consumption and for delivery abroad, as well as for prompt delivery. They followed up this action by entering more aggressively into the export market than they had ever done before; and at the same time they took steps to extend their home and continental trade. But while the German Syndicate were busy in this way, British producers were jogging along very much as usual, and trying to cling tenaciously to a price which circumstances made it impossible for them to maintain. They had no proper means of guidance; no competent and effective centre from which observation could be made of what was happening beyond their own doors. Germany was pushing its sulphate of ammonia of 25 per cent. quality, and low moisture and acid content, at much lower prices than British producers were asking, and they were driving a big wedge into the export business. Why did the German Sulphate Syndicate lower their price in November, 1913? Because they realized what the British producers, partly through lack of a proper intelligence department, failed to realize. What the latter failed to realize —although some of the facts have been reiterated in their ears, and have been laughed at by some as being visionary, and as having no material actuality—were, as Messrs. Bradbury and Hirsch say, the significance of the very much larger supply of nitrate of soda, of the larger output of sulphate in Germany in 1913, of the incapacity of Germany to find room for the whole of its production at home, and of the considerable increase of output of nitrogenous fertilizers in Germany, Norway, and Sweden. The result of the strange failure of the British producers in these respects was that they allowed Germany to promptly make a substantial entrance into the export and continental markets. It rests with every British producer to say whether he is going, while the war lasts and after, to favour a policy of supineness, or to take part in the active work of the Sulphate of Ammonia Association, and in the policy framed by combined consideration and decision.

If one studies the shipment statistics in the annual review, one ascertains the actual effect (and this is only the commencement) of the competition on the part of Germany. Just mark this: Between January and June last year, Germany and Belgium together found it necessary to export 41,000 tons more sulphate than they did during the corresponding period of 1913. The result was that there was a material shrinkage of the Continental demand upon British production; and the Pacific markets and those in the sugar colonies were also invaded by Germany. Let us repeat that this is only the beginning of the attempt—Germany is quite within its rights in making the attempt—to cut British production out of these overseas fields. It is for British producers to take means which shall be effective in restricting this inroad into their markets as far as may be necessary in the interests of the home supply of sulphate, and during the continuance of the war a great deal should be done by them in strengthening their position. Since the war, shipments of sulphate have declined. This is only natural. Financial disabilities were at first blameable. But on these being largely removed, there was soon palpable evidence of the absence of Germany and Belgium from the export markets, to the advantage of this country. Had it not been for this, the result of British sulphate of ammonia trading during 1914 would have been much worse than it really was. Among other advantages, there was, during the second half of the past year, an increase in the sales of 23,522 tons to Holland and the sugar colonies and 2207 tons to Spain; and the only reason for this is that demand has been made upon this country to fill gaps in requirement caused partly by the incapacity of the German producers to perform their prearranged obligations. It was a good thing for this country that there was this "windfall;" for Japan, a good buyer in the forepart of the year, was comparatively a distinctly bad one in the second half. In the result, the total shipments of this country for the whole year only fell behind those of 1913 by 10,837 tons. If British producers do not give heed to the lessons preceding and during the war, and strongly establish themselves in the matter of quality and good reputation in comparison with the German product, they will only have themselves to blame in the time that is to come.

Now a few words as to prices. Readers know well the zig-zag course followed by market values in the early part of last year, in part due to the action of the German Syndicate, and to the already explained conditions which induced the Syndicate to take the course they did. Prices in the first half of the year fell to levels for the equal of which it would be necessary to go back to 1895; but there was an improvement just before the war. Then the collapse. But in the last quarter there was a revival, due, as previously said, to the improvement in exports and the absence of Germany and Belgium from the overseas business. Finally, December values put on flesh to an extent that raised them to above £12 per ton. But the average price for the year is £11 7s. 1d. per ton, which is £2 os. 5½d. per ton less than the average for 1913. Again there is reason for thankfulness that the position is not worse. Had it not been for the war, it is certain that a lower average price would have had to be recorded.

The increase in German shipments prior to the war, and the production of synthetic ammonia in Germany and of other nitrogenous fertilizers in Scandinavia, indicate what would have happened if there had been no war. What these things point to supplies the strongest possible *raison*

d'être for the Sulphate of Ammonia Association. Of current conditions—particularly the inability of Germany to enter into outside contracts—the most has to be made, given adequate transport facilities. The war is not going to last for ever; and competition will then again soon flow from Germany, Austria, Sweden, and Norway.

Capital, Prices of Material, and Extensions.

It was in the editorial columns in the first number of the "Journal" for November last that the question was advanced for discussion as to the position of statutory gas companies in respect of capital-raising during the continuance of the war and the supervening financial conditions, which it is inevitable will become more and more stringent. There appears to be a division of opinion in the industry as to whether there is any sufficient reason for asking Parliament for some relief from statutory control and obligations so that gas companies should not be at a disadvantage in the matter of raising the capital required for extensions and the purchase of gas-consuming appliances to meet the needs of the public. For example, the possibility of the price of gas having to be raised solely through the conditions produced by the war and reduction of dividend following in the case of sliding-scale companies (with also higher deduction for income-tax), suggests the desirability, in order that the market value of stocks may not be depreciated any more than it will be by external influences, of asking Parliament to allow dividends to be maintained at the figure existing before the price of gas had to be increased through war conditions, with, of course, no increase in dividends till the price of gas is reduced below the pre-existing figure.

Some men in the industry who are taking thought for the morrow as well as for to-day think that statutory gas companies should pursue the prudent course of endeavouring to protect their capital interests against the unknown conditions of the future; while others, who do not seem to appreciate the difference between statutorily controlled gas companies and ordinary trading enterprise without limitations of price and dividend, restrictions as to capital-raising, and bounds upon reserves and carry-forward, fail to see why gas companies should have any preferential consideration in the matter. There can be no question of preferential treatment in respect of two forms of trading so distinctly at variance in their conditions—one under financial restriction; the other not. It is safe to say (and this must not be forgotten by those who are content with their comfortable position to-day) that we are only on the borders of the financial circumstances that are going to arise from the war, and to rule long in the future; and before the worst financial effects are upon us, it is the duty of all to make betimes the best possible provision for lightening them when they do really arrive. Before the worst conditions have come upon us, before stock proprietors have seen the reduced amounts figured on their dividend warrants, gas stocks have been sold which formerly produced prices yielding round about 5 per cent. on the investment at figures which yield about 5½ per cent. Stocks have been disposed of that have already dropped £8 to £10 of the premium per cent. of ordinary capital. An issue of £20,000 or £30,000, with a fall per £100 of £10 of premium, means a permanent loss to the undertaking of £2000 or £3000 upon which no dividend is paid, and a permanent higher charge (it may not be a large one annually) on the undertaking.

Nor is this the end of the matter. A further consideration is what can be bought by the dearer capital? Can more be bought now than it will be possible to buy later on, when capital may be dearer still? Since the war started, there has been reported a disposition among many gas companies to consider the putting off of works and distribution plant modernization and extension as long as possible, and the purchasing of stocks of appliances almost on the hand-to-mouth principle. Yet there is a considerable amount of works' modernization that could be done with good profit. With the prospect of capital becoming dearer still, there is also, as things are going, the prospect of gas companies and committees having to pay more for plant in the not distant future. If this fortunately does not result, so much the better. But there is the risk; and it is a risk more probable than improbable of development. The requirements of the Government in connection with the war, the replacement of wastage by them during and after the war, and shipbuilding work generally, now keep, and will for a long time ahead continue to keep, rolling-mills exceptionally busy. Already this, accompanied by the shortage of men since the war began, has caused the prices of plates to rise by some 20 per cent. With these conditions continuing, and supplemented by an increase in the price of coal and higher wages (which, in certain directions, is even now regarded as something more real than a prospective contingency), there is bound to be an enhancement in the cost of plates, joists, sectional material, &c. We think those who are deferring to the future modernization and extension, in the hope of easier conditions at an early date, will be disillusioned as time advances. Far from the conclusion of the war seeing a moderation of circumstances, it may be inferred from what is now known that the times will then become busier. Destruction has been rampant throughout Belgium and Northern France; and there is talk of laying to waste any part of Alsace-Lorraine that is likely to fall into the hands of our Allies. Whatever happens in the future, enough destruction has already taken place to make it certain that the classes of material to which we have referred will be in large demand for the restoration of bridges and other steel structures. However the matter is regarded, the policy of delay in putting in hand previously planned extensions and modernizing work calculated to be productive of economy appears to be a questionable one, and one worthy of early reconsideration.

Novelty in Gas Legislation.

Most things that exist (even the species in the beginning) have at some time or other been novel; but novelty in these fast-moving times is, as a rule, merely ephemeral. The submarine, air-machines of the various types, electric traction, the motor-car, and many other things which have had rhei tcreation in practical form within the memory of most adults had their novel stage; but they are novel no longer. The same in gas legislation. Every clause found in the Statute Book relating to the gas industry was at one time novel; most of them are so no longer. Rarely a session passes now without something of a novel nature finding its way into Gas Bills. It may be that some of the provisions upon which we look as novel are not really so. If we could only make memory a sufficient store-house for all the odds and ends of clauses that are incorporated in Gas Acts, and are perhaps heard of no more for years in connection with other Acts, it would sometimes be found that clauses which are regarded as novel have their precedents. It is not, of course, so in all cases. The calorific clauses had quite recently their day of novelty; but hardly a single progressive gas company now enters Parliament without asking that their illuminating power standard be laid to its final rest, and the calorific standard established. There is novelty in the general purposes clause, in its reference to residuals purchasing as applied to the South Suburban and Swansea Gas Companies, and as it appears in the Model Clauses—thus constituting a betrayal of the interests of the gas industry by those who ought to have protected the decision of the Joint Committee of the two Houses of Parliament. Long may novelty remain with this alteration. Promoters this session are protesting against its injustice by refusing to advance its application by embodying it in their Bills. The higher distribution pressure clauses passed last year are also novel. So are the high-pressure meter clauses in the London County Council and the City Corporation Acts; and so, too, to the best of our knowledge, is the clause in the Isle of Thanet Gas Act, and reproduced in a Bill this session, giving power to make a charge for special readings of meters in the case of short-period lettings of houses.

We could go on citing from a long list clauses which have been novel in their day, but are so no longer. Many sessions passed during which in gas enactment there were no changes of any particular note; but recent years have seen important alterations and substitutions which have been the parliamentary recognition of the development and fresh needs of the gas industry, and of the enlarged variation of its interests and entrance into new activities. We welcome the changes; they denote vitality. Some changes are merely the product of experience—perhaps purely localized experience. But, generally speaking, the changes effected are of common application. In the Scottish Orders reviewed this week, two or three clauses are found that are unusual, and we might perhaps endorse them as novel. The question of the responsibility for money placed in a prepayment meter is a vexed one, and one concerning which the legal decisions have been inconsistent; but the matter has never been fought out to any conclusive end. It would be well to have the question authoritatively settled.

In the Order promoted by the Port Glasgow Corporation, the matter is the subject of a provision after a shortened form of prepayment meter clause, in which the Corporation ask for nothing more than to be allowed to charge for prepayment meter and fittings a maximum of 10d. per 1000 cubic feet in excess of the ordinary price. The succeeding clause intends to specifically impose upon the prepayment consumer responsibility for the safe custody of the meter, and for all moneys deposited therein until the official collection is made, with liability for all damage caused to the meter, and for all loss through the wrongful abstraction of money from it, unless some person other than the consumer is prosecuted in a Court of Law for wilful damage to the meter and for the theft of money from it. We shall be curious as to the fate of this clause, and as to the weight of the argument which will be put forward if any question is raised in relation thereto.

It can only be considered as right that property of the kind being placed in the consumer's residence for mutual convenience—on the one hand, that the gas undertaking may do business, and on the other hand that the consumer may have on easy terms of payment the service of gas for lighting, cooking, and water heating, in cases room heating as well—that there should be some obligation on the part of the consumer to take due care of the property, although admittedly some working people are placed at a disadvantage, through the away-from-home occupations of the various members of the family, in giving constant protection to the contents of their habitations. Unavoidable circumstances in their case cannot constitute negligence. Parliament are strongly averse to loading-up the conditions of prepayment gas supply; and they are loth to grant addenda to the prepayment clauses which might impose hardship on the poorer patrons of this system of gas trading. This has been observed upon various occasions. There was an instance last year, when the Kidsgrove Gas Company essayed to make it, in their area, a penal offence to place discs or other tokens in prepayment meters, in lieu of the coin of the realm for which the meter was designed. The clause was not permitted, although the case is very strong for a preventative being applied to this all too common misuse of the prepayment system, especially in industrial communities, as witness the trouble at Manchester, and the prosecutions last year. This employment of substitutes for coins of the realm is a thing over which the consumer can have control; but he has not the same control over the thief who comes in the night, or who breaks in and steals during the absence of the family.

Also in the Port Glasgow Order is another clause which is not common in English gas legislation, and strikes one as curious in these days of payment for gas by measure, and the common law machinery which exists for dealing with damage. The clause has its origin in the Burghs Gas Supply (Scotland) Act, 1876, section 55. It provides in effect that if any person does, or causes to be done anything to produce, or wilfully fails to do anything for the prevention of, the waste, misuse, or undue consumption of gas, the Council may cut off the supply, and also recover the amount of all loss, damage, or injury. There was perhaps greater reason than now for a somewhat similar provision in the Gas-Works Clauses Act, 1847, when meters were not universal, and there was still in places sale by burner or contract, without the intervention of a consumer's meter.

A further unusual clause, referring to a sub-tenant's gas supply, appears in the Forfar Gas Order. It provides that the Corporation may, in addition to their recourse against the actual consumer, charge and recover from the tenant of a house who sub-lets the house furnished for any period not exceeding two months the amount of rates and charges for gas used and consumed, and any other sums due to the Corporation by the sub-tenant during such sub-tenancy. Unless the tenant, so sub-letting his house, arranged for a rent adequate to also about cover the value of the gas consumed, or made other provision for the security of payment, it would be a simple matter for him to determine his custom of the gas department, and for the sub-tenant to become the consumer. It would in this way be easy for the tenant proper to transfer his liability; and the new clause would not then have any useful effect.

These are a few of the miscellaneous points which have about them more or less novelty, and which arrest attention in reviewing the gas legislative proposals of the current session. Other matters have been alluded to in the last two issues of the "JOURNAL."

Foundations for Vertical Retorts.
High-Power Lamp Measurements.

THERE were two useful, if only lightly controversial, papers read by members of the staff of the Bradford Corporation Gas Department at the meeting of the Yorkshire Junior Association on Saturday last. The subject-matter of the papers came from very opposite extremities of technical gas affairs. Mr. E. J. Sutcliffe dealt with the concrete foundations for a Woodall-Duckham retort-bench, and Mr. J. W. Roper with a method of measuring the candle power of large-unit incandescent gas-lamps. Retort-bench foundations claim consideration before the illumination derived from the primary product of the utilization of the settings. In connection with vertical retort-settings, the foundations are of the utmost importance, in view of the weight of the superstructure, and the necessity of maintaining the original interior alignment of the retorts in order to ensure ease in working; subsidence producing retort deformation, of course contributes to the hanging-up of charges. The point is important in both the intermittent and continuous systems—although perhaps more so in the former than in the latter. The site of the house at the Birkshall works was one over which Mr. Charles Wood, the Corporation Gas Engineer, had to exercise care, for only some 20 to 30 feet below the surface the whole area of the works was honeycombed by coal workings. These were carefully filled up, so that there was no danger of settlement on this score. Apart from this condition, three shafts that were sunk disclosed a fairly considerable variation of the subsoil; but fortunately there was a firm, hard, compact clay immediately under the surface. On the whole, therefore, with the coal workings filled in, it was not a very difficult site, from the engineering point of view. Over the entire site a concrete bed, 18 inches thick, was laid, forming one large solid base or platform; thus distributing the weight of the superstructure over a considerable area. Not less than 5 feet depth was given to the concrete bases for the bench stanchions.

There is something in the nature of a little criticism by Mr. Sutcliffe of the fact that the Woodall-Duckham settings are erected upon built-up steel stanchions, and not upon brick piers as in the Glover-West system; and the point is made that the weight upon the bases of these stanchions is much greater per unit of area than when it is distributed by brick piers. There is not much, if anything, in the point. The general practice with the Woodall-Duckham system is to put down a reinforced concrete raft (by the way, it is noticed the reinforcement is only carried over one-third part of the bed laid down by the Bradford Corporation Gas Department), which reinforced raft is a comparatively inexpensive thing, and the weight of the bench is distributed over it. At the gas-works at Cleckheaton and Poole, the reinforced concrete raft carries not only the vertical retort-settings but the retort-houses as well; and there has not been the slightest trouble with foundations at either place. Where the ground is good, and conditions generally permit, there is not the slightest objection to the building of the Woodall-Duckham settings upon brick piers. The main reason for the preference for steel stanchions is that they afford more room under the settings. We have seen some settings with broad based brick piers that give a crowded appearance under the benches, and afford barely sufficient room for the running of the trolley-skips connected with the telpher system. But here again, there is not the slightest reason why, to obtain more accommodation, a combination of steel stanchion and brick base covering should not be adopted. Before concluding his paper, Mr. Sutcliffe speaks of the value of a mechanical concrete mixer—in securing good mixing, in enabling variation of composition, and in obtaining greater uniformity than when the work has to be done by hand. In this particular case, the saving in labour on the job through the use of the mixer more than paid for the machine.

The measurement of the candle power of large-unit gas-lamps is a matter that really few gas-supply concerns have taken in hand; the managements having been for the most part content to accept the duty ascribed to the lamps by the makers—quite irrespective of whether the conditions of use are in all details in conformity with those that obtained when the tests were made by, or on behalf of, the manufacturers. A simple and generally applicable method of testing such lamps is a desideratum. The apparatus designed by our photometrical instrument makers for this particular purpose is, for the most part, of an expensive order, and requires

a fairly spacious room in which to carry out tests—more particularly when testing candle power at different angles. Mr. Roper's paper describes how he has equipped a room in an inexpensive manner for such testings—using, instead of a photometer specially devised for the purpose of testing large unit lamps, a "Holophane Lumeter," by means of which, a white disc, a movable screen, and other constituent parts, he is able to get a "reliable" test of the candle power, and the illumination readings enable the plotting-out of polar curves. By the "Lumeter" the illumination (at any measurable point) in foot-candles of any source of light can be obtained; and multiplying the foot-candle reading by the distance in feet squared gives the candle power of the lamp under test at the angle at which the reading is made. While this is true, we are not particularly enamoured of obtaining "reliable" candle powers in this indirect fashion—there being too much scope for error. Mr. Roper himself speaks of the need of frequent testing of the "Lumeter" against a light standard; and the calculations that have to be made at each reading of the foot-candles, and at each angle, opens another way by which to go astray. We should like to see comparative candle-power results from large-unit lamps obtained by the direct method as well as by Mr. Roper's plan, which is ingenious, and should have value where it is not desired to put in a more expensive equipment, and where only approximate candle power values of large units are required. The paper does not tell us how near the results by the equipment have confirmed the nominal distinctions, in terms of candle power, given to lamps by their makers. Information of this kind would also be interesting. However, the value of the paper lies not only in its suggestiveness, but in the full detail as to how to fit up a place to carry out tests on the lines described by the author.

Calorific Power and Provisional Orders.

There are, having in view current circumstances, a good number of Gas Provisional Orders for the consideration of the Board of Trade; but, quite different from the Bills deposited in Parliament, the promoters are generally asking for the continuance of the illuminating power standard, and the bringing down of a higher standard to the 14-candle level. In the Heathfield and Waldron Order, it is proposed that the Board may, *at any time*, substitute the calorific power standard for the illuminating power one. It would save trouble later on if the Board of Trade exercised their right, and at once made the transfer in all cases from illuminating power to calorific value. It would be rather interesting to learn why there is in the Orders this concurrence in suggesting the retention of the illuminating power standard, while the Bills being promoted in Parliament are generally adopting the calorific standard. The Orders deposited at the Scottish Office are also disuniform in respect to the standard, The Cowdenbeath Gas Company desire the calorific standard (540 B.Th.U.) and test on the model lines, while the Port Glasgow Corporation follow the conditions cast last session, while adopting 550 B.Th.U. as the standard. In the case of the Forfar Corporation, they are proposing to adhere to the illuminating power standard and to bring the prescribed figure down to 14 candles.

A Fully Representative Protection Association.

The Chairman of the Gas Companies' Protection Association (Mr. H. E. Jones) has a matter concerning the gas industry that especially lies very near his heart, and that is to make the Gas Companies' Protection Association fully representative of the interests of the gas companies of the United Kingdom by including in its ranks companies not only great but small, and not only statutory but non-statutory. To this end, he has sent out a circular-letter, which we reproduce in our "Correspondence" columns, and for the contents of which we ask the earnest consideration of all gas companies who have not yet enrolled themselves as members of the Association, the subscription to which is of modest amount. We need not here speak of the good deeds of the Association for the industry at large, nor of the advisory helpfulness to the subscribing members. Those having administrative and executive control of the affairs of the Association are specialists in gas legislative and legal work; and this enhances the capacity of the organization for effective service. One of the last acts was to render assistance to the Long Eaton Gas Company in their fight over the "preferential charges" question, which secured decisions in the Chancery Court and the Court of Appeal that have brought home to some electricity suppliers the unfairness of certain of their methods, and revision has already set in. Work of the kind set out in the circular-letter—work which includes the maintenance of a strict watch over legislation, and often appearances by Counsel before Parliamentary Committees—cannot be carried on without adequate funds; and had not a few generous companies supplemented the subscriptions of the existing members by pretty considerable lump-sums when circumstances required, the limits of the operations of the Association would have been much curtailed. This supplementing of funds ought not to be necessary; and the wish of the Chairman that the Association should be made self-supporting by an extension of the membership is one which we hope will receive a worthy response. And not only from the monetary point of view is enlarged membership desirable. The greater the number of undertakings that are members of the Association, the greater its claim to be heard, and the stronger its voice. The price of co-operation is small; the proof of service is too weighty to be ignored. In the legislative work concerned with the changing state and progress of the industry, the Association in the effective assistance rendered ranks first among gas organizations.

High-Pressure Gas Lighting in a Melbourne Suburb.

By the courtesy of the Manager and Secretary of the Melbourne Metropolitan Gas Company, Mr. John Hinde, we are able to give some illustrations of a very effective installation of high-pressure gas lighting on the Keith and Blackman system which has lately been carried out by the Company in St. Kilda, the leading marine suburb—the "show suburb" as it is called locally—of Melbourne. It was recognized by the St. Kilda City Council that increased illumination was required at certain points in the city, and the Directors of the Gas Company submitted a scheme which was promptly carried out. Particulars of the installation are given elsewhere from a *brochure* prepared by the Company's Engineer, Mr. J. N. Reeson. It was inspected towards the close of November by the Mayor and members of the City Council, accompanied by the Directors of the Company, and much satisfaction was expressed at the improved lighting. A very effective contrast in methods of street illumination was afforded in the St. Kilda Road, one part of which is within the boundary of Melbourne, and lighted by electric arc lamps. The marked difference on leaving this area and entering that in which gas is the illuminant was duly noted, and it evoked comment very favourable to high-pressure gas. The Company hope to extend the system considerably. Meanwhile they may be heartily congratulated upon the successful *début* they have made.

Nitrogen Products and Carbide Company.

There seems to be fairly general disappointment among the shareholders of the Nitrogen Products and Carbide Company. One indication of this is that some of the shares were being offered for sale the other day, 10s. paid, at 5s. apiece. It has not transpired whether they found buyers. Now an article has appeared in the "Financier" which will not strengthen the confidence of the shareholders in the soundness of the position of the concern. The profits for 1914 as presaged in the prospectus did not materialize; and the increased profits which were to have followed in two years' time are destined to fail the same as did the German war time-table. The reason assigned for this condition of things at the meeting of shareholders was that the projected nitric acid works had not been erected in England; the delay being due to the efficiency of the works in Belgium having fallen off, and many months being required to hit upon the process of rectification. According to the article before us, last year's balance on the Belgium works was some £33,500 on the wrong side. It is an unfortunate thing for the Company that Germany did not defer the present war until the works were in a position to supply nitric acid on a large scale; for such an opportunity of doing business in this commodity on a similar scale is not likely to recur during the lifetime of any of the present shareholders. Then, again, although the producing capacity of the cyanamide works in Scandinavia has been increased, the factories have only been in partial operation—this being, we take it due to the fact that the nitric acid works in England were not in

existence to absorb the product, and those in Belgium were for a period out of action.

Monopoly Life and Value of the Patents.

But the matter about which there is particular uneasiness is as to the dependable length and value of the Company's property in the Ostwald and Brauer catalytic process for the production of nitric acid and nitrate of ammonia. The article points out that Dr. Joseph Knox, in his recently published work on the "Fixation of Atmospheric Nitrogen," makes this rather striking statement: "Technical details were gradually perfected, and in 1909 a factory was equipped at Gerte, Westphalia. Great secrecy is maintained with regard to the details of the process, *owing to the absence of patent protection in Germany*." If this italicized statement be true, then why were no patents granted? And if true, then it follows that the Nitrogen Products and Carbide Company may one day be assailed with competition from Germany by the very process the working rights in which they have acquired. The article proceeds to state that, according to the papers filed at Somerset House, the nitric acid patents acquired by the Company are concerned with the process of Ostwald and Brauer; and the patents referred to "seem to be" those dated 1902. If this is so, then they have not much longer to run. Succeeding is an allusion to the patent applied for in 1898 by two German chemists, Dr. Adolph Frank and Dr. Nikoden Caro, for the manufacture of cyanamide; and this was accepted towards the end of 1899. Assuming this is the patent upon which the Nitrogen Products Company are relying, there is only left a remnant of monopoly in its life. The "Financier" article certainly calls for some reply, if a reply can be made that will assist to re-establish confidence in the soundness of the Company's position.

War, Work, and Wages.

Increasing attention is being paid to aspects of the Labour question arising out of the war. The condition of employment in the engineering trades was eloquently depicted by the private conference which was opened some weeks ago in Sheffield between representatives of the Amalgamated Society of Engineers and kindred organizations and the Engineering Employers' Federation, to discuss the shortage of skilled labour. It was understood that one of the matters considered was the advisability of the Amalgamated Society temporarily relaxing some of their more stringent rules, so as to permit of the introduction, for the time being, of less-skilled labour in certain departments. After several sittings, the conference adjourned for a month; and last week the representatives met again and concluded their deliberations. No official communication of the result appears to have been made immediately to the Press; but there was reported on Saturday an announcement by the Executive Council of the Amalgamated Society "that the conference did not reach any definite recommendation, and no relaxation of the engineers' trade rules has taken place." This unfortunate position will no doubt soon be remedied. Trade unionists have it in their power to do much to help or hinder the nation in its struggle; and one would like to see them always do the "helping." There has, since the war began, been a meritorious reduction of serious friction in the industrial world; and it would be extremely regrettable if this record was to be interfered with by the adoption of an unreasonable attitude by the engineers, the materializing of a suggested stoppage by Yorkshire miners over an award given last summer by the Chairman of the Conciliation Board, or the bringing about of a threatened strike at the Cheltenham Gas-Works on the well-worn question of union "recognition." Is the unpatriotic example set recently by the municipal workers at Neath to be followed by the employees of the Cheltenham Gas Company? They, at least, could have no valid excuse for striking, whatever may be the merits of the other disputes referred to.

Some Figures.

What has been said relates to the bearing of labour on the war. A great many statistics regarding the other aspect of the matter—the "War in its Effect on Work and Wages"—are to be found in an article contributed by Mr. J. A. Hobson to the current number of the "Fortnightly Review." That the effect of the war has been to decrease employment in some industries and increase it in others, is obvious; but attempts to strike a balance must take into account the factor of enlistment. This, as the writer of the article points out, must be the main cause of the comparatively small amount of unemployment at present existing. Inquiries officially made among all the large, and many small businesses [the investigation covering about 43 per cent. of the industrial population] go to prove that the war would have caused about 10 per cent. of unemployment, all of which has been absorbed by recruiting. The trade union returns for July showed an unemployment figure of 2·8 per cent.; while for November it was practically the same at 2·9 per cent. A similar state of things is revealed by the percentage of unemployment in insured trades, which was 3·6 in July and 3·7 in November. Referring to wages, Mr. Hobson says that though the statistics on the point are now improving, "it remains a serious fact that the aggregate of wages at the end of last month stood at 11·4 per cent. less than a year ago; and though the whole of this fall cannot be attributed to the war, most of it must be so attributed." Many people will agree with the author in the contention he advances that the question of the proportion in which various trades are contributing to our new armies has not received the attention it deserves, and that, while "promiscuous recruiting is a doubtful policy for a short war, for a long one, in which the result may depend more upon economic exhaustion than upon military success, it is distinctly perilous."

The Commercial Intelligence Branch.

Interested as the majority of people are in particular industries, it is more than likely they will become closely acquainted with only a small portion of the work done during recent months by the Commercial Intelligence Department of the Board of Trade. That is to say, they will probably see merely the printed matter which has been issued by the Department relating to their own special line of business. This, in many cases—as has been indicated by the notices appearing from time to time in the pages of the "JOURNAL"—has been of a really substantial character; but it is not until the activities as a whole of this branch of the Board of Trade are considered, that an adequate idea can be obtained of the great amount of work which they have been doing. Last year, the number of personal and written inquiries dealt with was 40,600, of which no less than 29,700 took place during the last five months—that is, subsequent to the outbreak of war. In the previous year the total number was 16,700, and for the final five months of that period it was 7400. Over a hundred bulletins have been issued, dealing in detail with the trade of enemy countries in one or other branch of industry; the aggregate number of copies distributed being more than 330,000. Then, the Foreign Samples Section has held various exhibitions of goods for the benefit of British manufacturers; and additional ones will take place in the near future. Many other matters have also been considered by the Advisory Committee of the Commercial Intelligence Branch; and more will no doubt be heard of these in due course—particularly, it may be anticipated, the question of the possibilities of an extension of British trade with Russia.

Theory of the Coking Process.

This subject was dealt with by Herr E. Donath in a recent number of "Stahl und Eisen" [Vol. XXXIV., p. 60]. A sample of coal from Rossitz, near Brunn, containing ash 4·64, water 9·66, nitrogen 1·32, hydrogen 4·86, carbon 82·88, total sulphur 3·35, sulphur in ash 0·32, and combustible sulphur 3·03 per cent., when heated in an experimental coke-oven gave a molten product sufficiently fluid to run from a small opening at the base of the oven. This product quickly solidified to a shining black mass, containing ash 10·47, water 0·50, nitrogen 0·14, hydrogen 2·99, carbon 76·86, total sulphur 3·63, sulphur in ash 2·18, combustible sulphur 1·45, oxygen 7·59 per cent. The whole of the organic constituents were volatilized when the product was heated in a covered crucible, leaving only the ash. This behaviour resembles that of tallow, wax, and paraffin, and some resins; and the author concludes that during the coking of a coal of this type a mixture of compounds, consisting of the degradation products of the resinous and fatty constituents of the original coal-forming materials and also the pitch-like polymerized products of distillation under pressure, is completely melted, and decomposes on further heating without leaving any carbon residue. The decomposition products react chemically with the degradation products of the cellulose and protein constituents of the coal-forming material, cementing them into a carbon-like compound or mixture of compounds. At higher temperatures the protein degradation products in the coal soften; and during the complete gasification of the coal, stable compounds are formed containing sulphur and nitrogen, and these compounds are present in the coke.

PERSONAL.

Mr. ALEXANDER NISBET, the Commercial Manager of the Lochgelly Gas Company, has been appointed General Manager.

Out of 124 applicants, Mr. ARTHUR KILBURN, who has been for some years with Messrs. Hathorn, Davey, and Co., Limited, of Leeds, has been appointed Manager of the Roall Water-Works of the Pontefract Corporation.

At a meeting of the Anstruther (East) Town Council last week, Mr. W. G. READDIE, the Engineer, Manager, and Secretary of the Anstruther and Cellar Dyke Gas Company, Limited, was elected Provost of the burgh, in succession to Provost Oliphant, who resigned owing to ill-health. The new Provost has served the Council for several years, and occupied the Bailie's chair from 1903 to 1905. He is the present Chairman of the Parish Council, of which body he has been a member for a considerable number of years.

At last Tuesday's meeting of the Institution of Civil Engineers, it was reported that Mr. CHARLES F. BOTLEY, the Engineer of the Hastings and St. Leonards Gas Company, had been transferred from the class of associate members to that of member. The election of 101 associate members was also reported, among whom were: Mr. T. F. CANNING, recently appointed Engineer and Manager of the Weymouth Gas Company; and Mr. JOSEPH FISHER, of the Tottenham District Light, Heat, and Power Company.

As a token of appreciation of over forty years' valued service in the Leeds Corporation Gas Department, Mr. H. HULSE, the late Manager of the Meadow Lane Gas-Works (whose resignation of the position was notified in the "JOURNAL" for July 7 last year), has been presented with a gold-mounted umbrella and a purse of gold, and Mrs. Hulse with a silver jewel casket, suitably engraved. The subscribers included many members of the City Council, officials, and workmen of the Gas Department. The presentations were made by Mr. John Meecham, at a gathering at the Adelphi Hotel.

OBITUARY.

The death from pneumonia is announced of Mr. P. G. BROOKS (the Manager of the Handling and Transporting Department of Messrs. Robert Dempster and Sons, Limited), which took place on the 10th inst., at Huddersfield, after a very short illness.

We regret to learn from Mr. G. W. Anderson that Mr. URBAN FLETCHER, the Manager of the La Plata Gas Company, has sustained a severe bereavement by the death of his wife. Mrs. Fletcher underwent an operation at the French Hospital, Buenos Aires, towards the end of November, and was progressing reasonably when she died suddenly on the 10th ult. Mr. Fletcher has been a long time in the Argentine, to which he went as an erector for Messrs. R. & J. Dempster, at the St. Nicholas Gas-Works. He afterwards became Superintendent of Distribution under the River Plate Gas Company in Buenos Aires, and was subsequently appointed Manager of the La Plata Gas Company, which position he has held for the last fifteen or sixteen years.

Readers of the "JOURNAL" will remember that for some years the tables compiled annually by Mr. JAMES CARTER, the Borough Treasurer of Preston, containing statistics of rates, gas, electricity, and water charges, and profits and losses on municipal undertakings, have furnished material for interesting comparisons. The statistics for the year 1914-15 were fully noticed in the "JOURNAL" for the 22nd ult. (p. 686). We regret to learn that their issue was followed within a few weeks by the death of their compiler. Mr. Carter had a long and honourable record of service in Preston, of which he was a native. He became Accountant to the Corporation in 1875, and in 1881 was appointed Borough Treasurer. He was held in high esteem in municipal financial circles, and was at one time President of the Institute of Municipal Treasurers and Accountants. He served ten years in the Volunteer Artillery, then received a commission in the First V.B. Loyal North Lancashire Regiment (now the Fourth Battalion), and by successive stages attained to the command in 1906.

RETIREMENT OF MR. C. R. WILLIAMS.

Lighting Assistant to the Engineer of the Great Western Railway.

THE retirement, owing to ill-health, is announced of Mr. Charles Rowland Williams, one of the principal assistants to the Engineer of the Great Western Railway Company at Paddington. Mr. Williams is known to some of the members of the British Commercial Gas Association; and his relinquishment of his duties calls for notice in the "JOURNAL" from the fact that they included special attention to the gas lighting of the Company's stations and depôts.

Mr. Williams commenced his professional career in the Engineers' Office at Paddington in 1876 as pupil, and then assistant, to the late Mr. Lancaster Owen, the Constructive Engineer. In 1879 he was assistant to the Resident Engineer at Swansea (Mr. W. Armstrong, the present New Works Engineer to the Company), and the following year was himself appointed a Resident Engineer. He left the Company's service in 1885, and commenced practice in Westminster; but he returned to them in 1891, as Assistant for Maintenance Work. His two periods of service cover thirty-one years, during which he was connected with most of the important developments of the Engineering Department of the Company.

As previously intimated, Mr. Williams devoted special attention to the subject of gas consumption, both for lighting and heating; and since 1903 the expansion of this work and the recognized importance of technical control involved the organization of a Lighting Department of the Engineers' Office, under his charge, dealing with all but the electric lighting of the Company's premises. One result of this was a saving of many thousands of pounds annually in the Company's lighting bill, with a threefold increase in illumination generally. Other improvements followed, and the most up-to-date methods were adopted for new and existing installations.

Mr. Williams was in constant touch with leading authorities on illumination matters, and initiated conferences with officers of other railway companies who had studied lighting from an administrative point of view. He consistently advocated a systematic principle of "grading" the lighting of railways in relation to requirements, with standardized minimum illumination, instead of the haphazard and wasteful methods of the past. In this way any extra annual cost involved in lighting improvements at a few stations would be paid for over and over again by the great general saving accruing from modern economic methods applied to all gas lighting. In the vexed question of "Gas *v.* Electricity" he has been a prominent and successful champion of the former illuminant, which has in many cases been adopted entirely through his advocacy, in the face of strong claims on behalf of electricity and power facilities. Those engaged in the gas industry have consequently to thank him for his continued and strenuous support during many years, both in his professional work and in contributions to the Press; and the hope may be expressed that his health will benefit by his retirement.

THE GAS INDUSTRY AND THE WAR.

With a view to removing the uncertainty which had been manifested in the Press during the week on the subject of the national dyeware scheme, "The Times" on Saturday published the following intimation: "It is now possible to state authoritatively that the Government have no intention whatever of relaxing their efforts to establish a national dye industry. The exact position is that the Consultative Committee of Traders appointed to advise the Board of Trade held a meeting on Wednespay evening last to consider the results of the circular appeal made to traders. The meeting was adjourned for a week without coming to any decision, and consequently the Board of Trade have not yet received their report. But while any suggestions the Committee may make in their report will receive full and sympathetic consideration from the Board of Trade, in any case, even if the report be adverse, the Government are fully determined to go on."

The slow response of the dyeing, textile, and allied trades to the call for capital in connection with the national dyeware scheme has led to the further consideration of their proposals by the Government. A conference on the subject was opened at the Board of Trade Offices some days ago, and is to be resumed this week. Meanwhile, at a representative meeting of the Wholesale Textile Association held in London, under the presidency of Lord Hollenden, the serious position of many textile industries arising out of the German monopoly of aniline dyes has been fully discussed. Eventually, on the proposition of Sir George Pragnell, it was unanimously resolved that the proposals for the formation of a Stated-aided company in Great Britain would not warrant them recommending their members to apply for shares at present. The Committee were, however, requested to watch the progress of negotiations very closely, and, if thought advisable, to appoint a delegate to assist in working out a scheme which would be satisfactory to all parties. The Council of the London Chamber of Commerce have also passed a resolution that, "in view of the grave danger which threatens our textiles industries through the failure of the supply of aniline dyes, steps should at once be taken by the Government to secure the establishment of aniline dye factories in this country by the guarantee of adequate tariff protection for at least ten years after the termination of the war;" and that "such protection should be considered as a means of meeting a national emergency, and in no way as a precedent for future action on the same lines."

In connection with the problem of the supply of coal to the Metropolis and its neighbourhood, it was stated at the Admiralty last Thursday, says the "Daily Telegraph," that prize ships are not to be employed, "but that a number of the detained enemy ships—vessels which will presumably be handed back to the enemy at the conclusion of the war—will be employed for the purpose. The Admiralty are not prepared to state the number of ships that are to be thus used; and it is therefore impossible to assume the effect of this step on coal prices in the South of England. It may

be assumed, however, that the increased sea-borne traffic from Northumberland and Durham will have some effect in guarding against any further increase, even if it does not tend towards a slight decrease in the present coal prices in the Metropolis. The Newcastle Quayside Advisory Committee were informed that twenty interned vessels will be requisitioned as soon as they can be manned and equipped, and that ten more will be released as soon as possible. Of these vessels, however, it is said that the Admiralty have commandeered eleven; so that practically only twenty will be added to the fleet now engaged in the coasting trade."

An inhabitant of Ostend who has reached Holland, has narrated his experiences to a local paper; and a summary of them has been sent over by the Rotterdam correspondent of the "Daily Telegraph." "Ostend," he says, "lives in an atmosphere of fear. We had many things to dread; and the spectre of famine was continually before us. In Ostend there are no vegetables, scarcely any coffee, and no tea; for the Germans have demanded almost all the provisions. The stocks of coal have long been finished, and the gas-works are not in operation."

A message through Reuter's agency states that the military authorities of Paris have just submitted certain measures to the Government which will be brought to the notice of the public as soon as they have been approved. They have for their object the diminishing of the volume of private lighting by the extinction of the outside lights of shops, the closing of shutters, or, failing that, the drawing of curtains. The same precautions are prescribed for the suburbs of Paris, especially for the workshops where work is carried on by night, and the light is visible from a great distance.

The effect on gas consumption in Germany of the first month of the war is shown by the statistics collected by the Central Gas Publicity Bureau, which have just been published for the months of July and August last. In July the total consumption from 647 German gas-works showed an increase of 5·3 per cent. over that for the same month of 1913; whereas in August the total consumption from the same number of works showed a decrease of 4·4 per cent. from that for August, 1913.

The Directors of the Croydon Gas Company, it is announced in the January number of the "Co-Partner," feel that under the circumstances at present existing, those co-partners who have been called up for service, as well as those who, with the Company's permission, have since enlisted, should not be allowed to suffer as co-partners on that account; and they have decided that the bonus which each one would be entitled to had he still been performing his usual duties shall be credited to him as previously. The Directors have also given instructions that the places of all men called up or enlisting with the Company's consent for the period of the war shall be kept open for them to return to at its expiration. In addition to this, all married men are being paid their full wages or salaries, less the Government pay and separation allowances. In regard to the single men with dependants, each case has been separately considered by the Board, and a suitable allowance granted. The annual cost to the Company of the allowances at present being paid is about £1600.

Mr. R. O. Brown, the youngest son of Mr. Thomas Brown, the Engineer and Manager of the Matlock and District Gas Company, enlisted in the Fourth Hussars early in September last, and has since then been training at the Curragh, Ireland. He has now been granted a commission as Second Lieutenant.

The latest member of the firm of Messrs. J. & W. B. Smith, of Farringdon Road, E.C., to join H.M. Forces is Mr. Frank Watkinson, son of the late proprietor of the firm. Mr. Watkinson has been appointed as Lieutenant to the Mechanical Transport Section of the Army Service Corps.

It may very safely be said that when the Directors of the Wellingborough Gas Company provided mess-rooms for their workmen, they never dreamt that these would some day be utilized as a temporary hospital for men wounded in the service of their country in a great European War; yet so it is. The rooms have been fitted up for the purpose by the County branch of the Voluntary Aid Detachment; Dr. W. E. Audland has been placed in charge of the hospital; and the nurses are all members of the above-named organization, which has in the past done much for the sick and afflicted in the district. Mrs. Audland, who is greatly interested in the work, has given assistance to the staff; and Mr. J. T. Lewis, the Engineer of the Company, who has given up his office into a nurses' room, has rendered help in carrying out the arrangements. A number of wounded men arrived at Northampton on Monday last week, and twenty of them were conveyed by motors to Wellingborough, where they found at the gas-works beds ready to receive them, and a staff of nurses to attend to them.

The South Metropolitan Gas Company have agreed to allow the Camberwell Borough Council a rebate of £631 upon the last quarter's account, in respect of gas not consumed owing to the diminution in street lighting. The Company are also allowing the Deptford Borough Council a rebate amount; but the exact figures have not been made public.

Considerable discussion took place at the meeting of the Teignmouth Urban District Council last Tuesday on the question of the diminished lighting of the sea front. The Chairman (Mr. Harris) complained that the police had ordered certain lights to be extinguished, without seeking the concurrence of the Council. The Clerk explained that in October the Council resolved that all street-lamps in the district be extinguished or obscured on the sea side as required by the police; and the matter was left in the hands of the Surveyor and the Gas Manager. The Chairman said the resolution was meant to refer only to the sea-front; but Mr. Turpin pointed out that lights in one road, which had been extinguished by the police, were visible from the bay, and stood out very clearly. The Surveyor thought that, if the Council did not wish these lights to be extinguished, the object of the naval and military authorities would be served if the lamps were screened on the seaward side. Mr. French thought the extinguishing of the lights on the sea-front at Teignmouth was absurd and ridiculous. The Clerk reminded the Council that they had been specially thanked by the General Commanding the Defences for the prompt action they had taken in extinguishing the lights on the front. It was decided, on the casting-vote of the Chairman, that the authority hitherto given to the Surveyor and Gas Manager to decide which lights should be extinguished be revoked, and the matter left to a Committee of the Council with power to act in consultation with the Surveyor and the police.

At a meeting of the Ashbourne Urban District Council, a letter was read from Major Brown, of Buxton, stating that the War Office had intimated that there were a large number of unskilled workmen employed at water-works, gas-works, and other public works, eligible for service, and requesting the employers to give them every facility to enlist.

Some dissatisfaction has been expressed in the Worthing Town Council at the fact that a further request has been received under which the whole of the lights of the town will be extinguished at 11 o'clock, with the exception of dangerous corners in the main thoroughfares. Mr. Gardiner said this was a serious matter; and it should be understood, if any danger to traffic arose through the reduced lighting, that the Corporation would not be responsible. They were simply acting under the instructions of the police. Mr. Duffield added that the present state of things was causing people to get "nervy" and "panicky." All the Home Secretary asked was that the lighting should be reduced to a minimum consistent with public safety. He questioned whether the police, or whoever was responsible, had not overlooked this aspect. How the present lighting could be regarded as "consistent with public safety," passed his comprehension. He urged the Highways Committee to make a firm stand, and not to cut down the lighting just because the police wanted it done. The Mayor (Alderman J. White) said he had insisted on the police putting their requirements into writing, so that if damage occurred the Council would be cleared as to monetary payments. The Town Clerk pointed out that if the Corporation, as the Lighting Authority, were of opinion that the requirements of the police (which the Home Secretary knew nothing whatever about) were not consistent with public safety, it was the duty of the Corporation to make representations accordingly.

COAL, COKE, AND RESIDUALS MARKETS IN GERMANY.

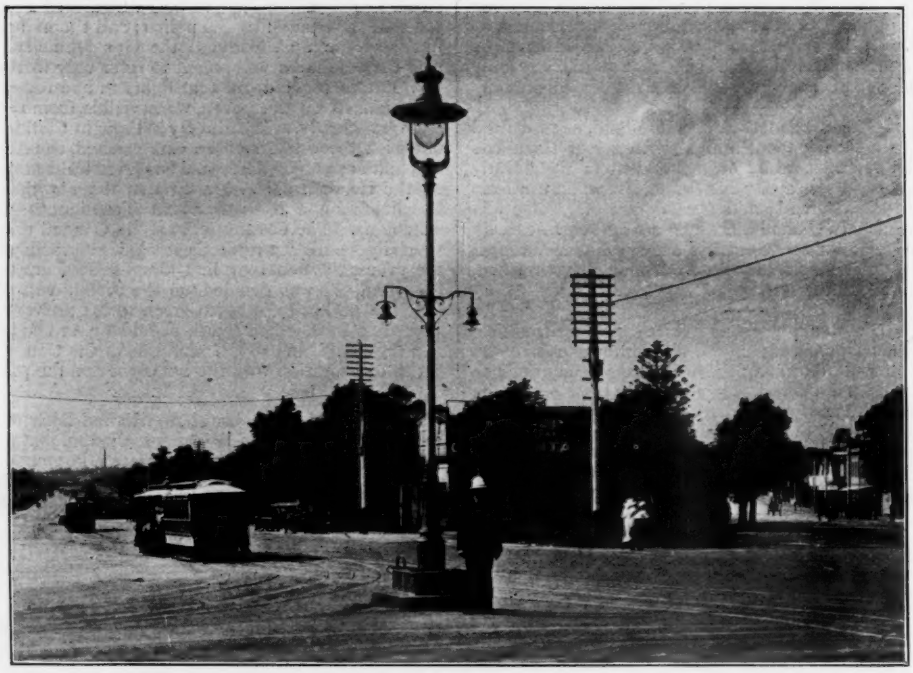
THE latest market report to hand, in the "Journal für Gasbeleuchtung" of the 19th ult., states that there was a brisk demand for coal in Germany—especially the Northern and Eastern districts, which commonly receive large supplies from England. The gas-works in these districts in particular were finding great difficulty in obtaining the necessary supplies. The Upper Silesian coal owners were unable to meet all demands; the Westphalian Coal Syndicate could barely supply its usual customers; and the output of the Saar coal fields had been reduced by nearly 50 per cent. of its normal quantity. Gas-works, moreover, were often unable to obtain coal of the grade to which they have become accustomed; and this put them at a further disadvantage in meeting the competition of the forced production of oven-coke. Coal prices for the first quarter of the present year are fixed at an advance of at least 1s. per ton at the pit's mouth; whereas oven-coke is 1s. 6d. per ton lower in price.

The embargo which the German Admiralty has laid on tar has resulted in the accumulation of immense stocks in tar-works, gas-works, &c., and there is an agitation, stimulated by the roofing-felt makers, for a big reduction in the selling price of tar. Since the demands of the roofing-felt industry have fallen off by 50 per cent., and export of crude tar from Germany has been prohibited, it will be impossible, our contemporary remarks, to prevent a considerable drop in the market value of tar; but the writer of the market report considers that a reduction of more than 15 per cent. should not be entertained by gas-works.

High prices are ruling for sulphate of ammonia—viz., in the vicinity of the Elbe and west of it from about £13 10s. per ton for ordinary grade (25 per cent. ammonia) to £13 15s. for the 25½ per cent. grade; and east of the Elbe about 5s. per ton above these prices. These quotations refer to lots of 5 tons upwards.

HIGH-PRESSURE GAS LIGHTING AT ST. KILDA.

Improved Illumination of a Leading Melbourne Suburb.

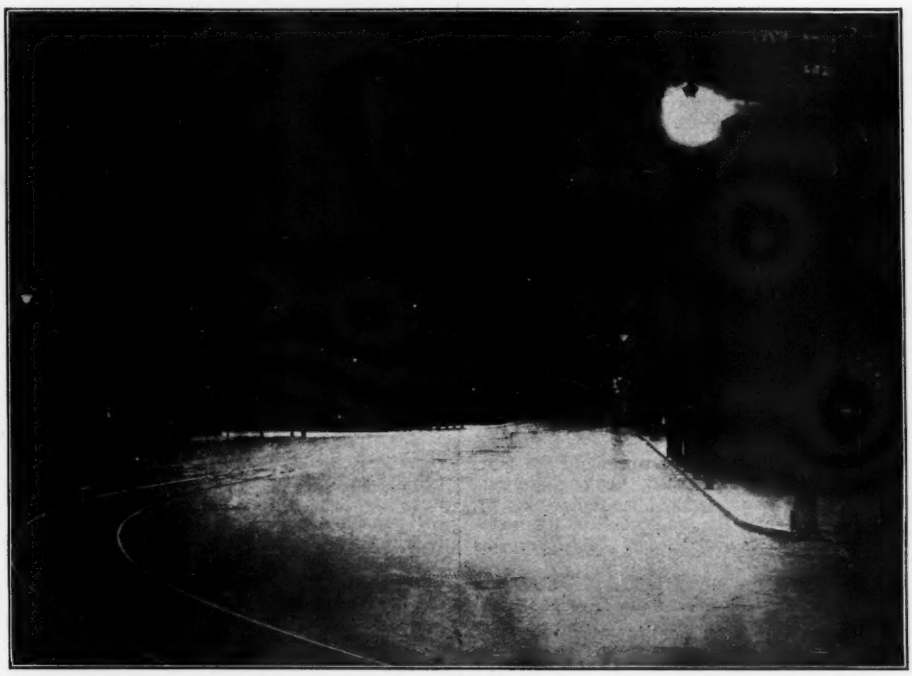


THE lighting of the public thoroughfares is generally very inefficiently carried out in Melbourne, and there has hitherto been no attempt to provide adequate lighting to illuminate properly the streets of the Metropolis. It is recognized that the proper lighting of the streets is as necessary as any other public duty; and in this, as in many other instances, the city of St. Kilda, the leading marine suburb of Melbourne, has taken the lead, and adopted a system of high-pressure gas lighting in three of its main thoroughfares. The installation is a great advance on anything hitherto seen in Melbourne. It was carried out by the Metropolitan Gas Company; and by the courtesy of Mr. John Hinde, the General Manager and Secretary, and Mr. J. N. Reeson, the Engineer, we are able to give some illustrations of it, together with a few particulars contained in a *brochure* that was prepared by Mr. Reeson.

The portion of the city selected lends itself admirably to lighting effects. The broad thoroughfares and the noble esplanades, where so many thousands of people congregate, demand ample light; and the City Council has done much to meet this demand. The vast increase of traffic to the beach during the past three or four years, and the congregation of pleasure seekers, had rendered even greater provision of light necessary; and at this juncture the Directors of the Gas Company came forward with a proposal to instal high-pressure gas. The offer was accepted, the work was put in hand in a quiet and businesslike manner, and, almost before the public were aware of it, Fitzroy Street in particular was, to use the words of a local paper, "flooded of an evening with streams of brilliant light. St. Kilda, the 'show suburb' of the Metropolis, is at last fittingly illuminated."

The lighting begins at the city boundary in the St. Kilda Road, where a lamp of 4500-candle power is installed. The succeeding lamps, affixed to brackets on poles on either side of the road alternately at a distance of 50 yards, extend from the boundary to the Junction, and are each of 1500-candle power; while those along Fitzroy Street to the Esplanade are each of 1000-candle power. Two lamps, each of 4500-candle power, are placed at the Junction and at the corner of the Esplanade and Fitzroy Street respectively. The lighting of the Esplanade is done by 15 lamps placed on columns along the upper pathway; the lamps being of 1000-candle power each. The lamps are placed at heights varying from 20 ft. 6 in. to 23 ft. 6 in., so that the light is utilized to the best advantage. They are of the Keith-Blackman inverted mantle type, and give an efficiency of from 60 to 70 candles per cubic foot of gas consumed; and they are very similar to those installed in London and elsewhere. At present only the three 4500-candle power lamps are automatically lit and extinguished, though this principle can be applied to the other lamps if found desirable.

The gas is compressed to a pressure of about 3½ lbs. per square



inch by means of a rotary pump driven by a gas-engine placed at the governor-house in St. Kilda Road, and is conveyed along the route in steel pipes. These pipes really form one long pipe, inasmuch as the different lengths, instead of being jointed in the usual way, are welded together.

A party of gentlemen, comprising the Directors of the Gas Company, the Mayor (Mr. Hewison) and councillors of St. Kilda, and representatives of the Press, inspected, in motors, the installation on Friday evening, the 27th of November. A very effective contrast in methods of street lighting was provided along the St. Kilda Road, a portion of which is within the Melbourne boundary, and is lighted by electric arc lamps supplied with current generated at the City Council's own station. The marked difference on leaving the electric area and entering the gas area (they form a junction at one of the cross main thoroughfares) is, we learn, attracting general notice, and comment is favourable to the high-pressure gas. The inspection proved satisfactory in every respect.

The motor trip ended at the George Hotel, where light refreshments were provided. In proposing the toast of "The City of St. Kilda," Mr. J. Grice, the Chairman of the Gas Company, said the question of street lighting had been handled by the St. Kilda Council in a prudent manner. They had not been led away by the crusade of electric light. The most modern and best form of street lighting was now recognized to be by high-pressure gas. The Mayor, in responding, said he fully believed it to be a fact that St. Kilda was the first Municipality to adopt the incandescent burner; and it was now in the proud position of being the first to reap the benefit of the high-pressure system.

GAS LEGISLATION FOR 1915.

[THIRD ARTICLE.]

No Gas Provisional Orders were lodged with the Local Government Board for the present session; but thirteen dealing with gas matters have been deposited at the Board of Trade, and five at the Scottish Office.

Taking first, in alphabetical sequence, the Board of Trade Orders, the one which is being promoted by the Cheadle Gas Company proposes that the capital shall not exceed £10,000, consisting of the ordinary share capital already raised, amounting to £6000, and additional capital of £4000. The dividend on the original capital is limited to 10 per cent., and on the additional capital to 7 per cent., or 5 per cent. on such part as is issued as preference. Borrowing powers on the usual one-third scale are desired. Works' authorization is included. The Company wish the standard quality of the gas to be prescribed on the illuminating power basis—the old 14-candle standard being named. The maximum price of gas is placed at 5s., with power of revision to the Board of Trade at the end of three years, and, if thought fit, the application of the sliding-scale. There is a little change proposed in the prepayment meter clauses. For meter, without fittings, a charge of 7d. is asked for (instead of 6d.), or 10 per cent. on the cost, whichever may be the higher. Protection for public and private supply against the casual demands of users of suction-gas plant is sought, and a stand-by clause also appears. All the other clauses are of customary form. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

The Ely Gas Company, Limited, are still desirous of extending their title by the insertion in it of the words "and Electricity" and likewise their operations by being invested with the necessary supply powers. The electricity area is defined in the first schedule to the Order; and in the second schedule a list of streets is given within which distributing cables are to be laid within a period of two years. The price the Company are to be entitled to charge for energy is for any amount up to 20 units per quarter, 13s. 4d., and for each additional unit, 8d. The promoters desire to be in the position to refuse a supply of electricity to persons who are indebted to them for gas and gas meter and fittings rent, or a supply of gas where electricity accounts have not been discharged. It is proposed to use part of the gas-works site for the electricity generating plant. [*Parliamentary Agents: Messrs. Monier-Williams, Robinson, and Milroy.*]

The Guildford Gaslight and Coke Company are seeking the definition of their limits of supply, and sanction to the raising of additional capital. Granted the rights, the area of supply will henceforth include the borough of Guildford, and the parishes of Albury, Artington, East Clandon, Merrow, Shere, West Clandon, Worplesdon, Bramley, Hascombe, St. Martha and Shalford, and Womersh. Following upon this, it is proposed that the powers of the Woking Gas and Water Company to supply gas in the parishes of East Clandon, West Clandon, and Merrow shall be repealed, and that, from the commencement of the Order, the name of the Woking Company shall be changed to that of the Woking Water Company. It is also suggested that the authorization of the Cranleigh Gas Company to supply gas within the parishes of Albury, Womersh, and Hascombe shall be repealed. An amendment of the standard price succeeds. It is asked that it shall be, in any portion of the limits of supply being more than four miles from the centre of the entrance gateway of the gas-works, 4s. 6d. per 1000 cubic feet, "provided that there shall be no increase of dividend above the standard rate in any half year during any part of which the net price charged by the undertakers within the said portion of the limits of supply shall have exceeded 4s. per 1000 cubic feet." Additional capital is sought to the extent of £100,000. Including the existing loans, the Company wish to be empowered to borrow up to one-third part of their fully-paid up capital. Then the repeal is contemplated, without prejudice to any powers conferred by the present Order, of the existing unexercised powers of raising consolidated ordinary stock, amounting to £2547, and of borrowing on mortgage or by the creation and issue of debenture stock. Land purchase powers by agreement are wanted; and then succeeds a proposed modification of the illuminating power standard from 15 to 14 candles. Among miscellaneous provisions is a stand-by clause. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Heathfield and Waldron Gaslight and Coke Company propose for their undertaking a capital not exceeding £15,000, consisting of the share capital of £5000 already raised (to be known as the original capital), and £10,000 of additional capital,

carrying respectively maximum dividends of 10 and 7 per cent., or 6 per cent. on such part as is issued as preference capital. The borrowing powers are on the usual one-third basis. Lands and works clauses are included. An illuminating power standard of 14 candles is proposed, tested by the "Metropolitan" No. 2 burner and using Harcourt's 10-candle pentane lamp as the standard. There is a proviso to the effect that the Board of Trade may, at any time, substitute a calorific power standard. The proposed maximum price of gas is not to exceed 5s. 6d. per 1000 cubic feet; power of revision, after three years, being conferred on the Board of Trade, with the right, if thought fit, to substitute a standard price with sliding-scale. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Hoylake and West Kirby Gas and Water Company seek further capital powers up to £15,000, provided that the share capital does not exceed in the whole £58,500. On such part of the new capital as is issued as ordinary, the dividend is to be limited to 7 per cent., and on the part issued as preference to 5 per cent. Borrowing powers equal to one-third part of the paid-up capital are desired. The Order embraces land and works powers. It is proposed, too, that the method of testing the illuminating power of the gas shall be transferred to modern lines, by using the "Metropolitan" argand No. 2 burner, and the Harcourt 10-candle pentane lamp as the standard. Among the miscellaneous clauses is a stand-by one, which, like the remainder, is quite ordinary in form. A few clauses special to the water undertaking are also incorporated in the Order. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

Succeeding is the Order whereby the Liverpool Gas Company seek, under the agreement arrived at with the Liverpool Corporation last year, the necessary power to acquire from the Corporation the Fazakerley Gas-Works, and an extension of limits so as to embrace Fazakerley. The date of transfer is Oct. 1 next. The consideration is (1) the payment to the Corporation of a sum in gross equal to the net debt owing by them for the purposes of the Fazakerley Gas Orders at the date of the commencement of this Order, and (2) the taking-over at a valuation of the stock-in-trade, implements, coal, and other stores held by the Corporation at the date of transfer. The "net debt" is defined as the net amount of any loans (including debit balances at the bank on capital account) raised for the purposes of the Fazakerley Gas Orders, and outstanding at the date of the commencement of this Order, after deducting (1) the amount existing at that date in any sinking fund formed for the repayment of such loans, and (2) the proportionate amount for the period from Jan. 1, 1915, to the commencement of the Order of the annual payment to such sinking fund. If there is disagreement as to the value of stocks, the matter is to be referred to an independent engineer appointed by the Board of Trade. Among other clauses is one repealing all powers conferred upon the Corporation by the Fazakerley Gas Orders. The Company retain the right to continue the gas-works on the Fazakerley lands. Protection is given to the Lancashire and Yorkshire Railway Company. Forming a schedule to the Order are a number of provisions relating to stock or money held under the co-partnership scheme of the promoting Company, and to money deposited with the Company by persons in their employ. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Melton Mowbray Gas Company are solicitous to obtain an extension of their supply boundaries, so as to include a number of additional parishes. There is indication that, in parts of the extended area, the Company are already trading, seeing that they ask to be empowered to continue, maintain, and use any mains, pipes, and other works laid down or constructed before the commencement of the Order within the additional territory, as if the same had been laid down or constructed under the powers of the Order. A standard price of 4s. per 1000 cubic feet of gas is now proposed, with the sliding-scale operating on the usual terms. Outside the urban district of Melton Mowbray, the price to private consumers by ordinary meter, it is intended, shall not exceed by more than 1s. the price for the time being charged by the undertakers to consumers, under like circumstances, in the urban district; but the Company reserve the right to charge in any one or more parishes outside the urban district a price less than that they are authorized to charge, provided that the reduced price shall not at any time be less than the charge within the urban district. Additional capital powers to the extent of £10,000 are required; but the share capital is not to exceed in the whole £32,000. Dividends are limited to 10 per cent. on the original capital of £18,000, 7 per cent. on the ordinary additional capital of £4000 already issued and on the new additional capital, and 6 per cent. on the part raised as preference capital. Borrowing powers up to one-third part of the paid-up capital are required. [*Parliamentary Agents: Messrs. Grahames and Co.*]

The Mid-Kent Gaslight and Coke Company have introduced a short Order principally for the purpose of authorizing them to raise unissued capital by preference shares. The clause drafted to give effect to this desire empowers the Company to attach a preferential dividend not exceeding 6 per cent., to the balance, or part of the balance, of the unissued capital authorized to be raised by their Act of 1899, and to create new preference shares. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Oakham Gas Company are seeking an extension of their district, and further capital authorization. A number of parishes are specified which it is desired to embody in the area of supply. The prescribed standard price in Oakham, it is contemplated, shall be 4s. 6d. per 1000 cubic feet, with the sliding-scale operating on the usual conditions. Within the outside limits of supply, the prices to ordinary consumers are not to exceed that charged within the urban district by more than 3d. in the parishes of Barleythorpe, Langham, and Burnley, and 10d. in the parishes of Braunston, Whissendine, and Ashwell. But the Company may charge less prices than those authorized in these parishes, provided that they are not less than the charge in the urban district. Additional capital powers to the extent of £6000 are desired, with the stipulation attached that the share capital is not in the whole to exceed £18,000. The standard dividends are 10 per cent. on the original capital of £8000, and 7 per cent. on the issued and prospective additional capital, and not exceeding 6 per cent. on the preference capital. As to borrowing powers, the Company ask for the right to borrow a further sum of £1000 in respect of the capital authorized by the Order of 1888, and up to one-third part of new paid-up capital. The standard of quality, it is proposed, shall be 14 candles, tested in the modern way. The Company also ask for the deletion of the words "or of storing gas" from the additional lands section of the Order of 1888. A stand-by clause is numbered among the miscellaneous ones. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Rothwell Gaslight Company want further capital authorization to the amount of £16,000. Borrowing powers are specified at one-fourth of the issued capital, instead of the usual one-third part. [*Parliamentary Agents: Messrs. Hamlin and Co.*]

Extension of limits, construction of additional gas-works, and the raising of further capital are the principal objects of the appearance before the Board of the Staveley Gaslight and Coke Company. The expansion of area is proposed in order to include the parish of Barlborough. Then follows the clause to confer power relating to works' enlargement. Further share capital authorization up to £5000 is sought; but the share capital of the Company is not to exceed in the whole £16,000. Regarding dividends, these are limited to 10 per cent. on the original capital of £4500, to 7 per cent. on the additional capital of £6500 and the capital now authorized, and to 5 per cent. on such part as is issued as preference. Borrowing powers are asked up to one-third part of the paid-up capital. The price of gas is to be the same within the extended area as the charge for the time being within the limits of supply as defined by the Company's Order of 1905. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

The Swanage Gas Company are desirous of setting their capital in order under these circumstances: By their Acts of 1901 and 1912, the Company were authorized to carry on a gas undertaking and a water undertaking, with a gas capital and a water capital respectively. In pursuance of the Swanage Urban District Water Act, 1913, the Council have acquired the water undertaking. The water capital of the Company consisted, at the date of the passing of their Act of 1912, and still consists, of £17,400 original water capital, and £28,600 of additional water capital, of which the Company had raised £13,900 of preference stock. The holders of ordinary water capital have agreed to forego all claim to participation in the assets available for division among the holders of water capital, so that the assets available should be returned to the holders of preference water capital, and a sum equal to 3s. in the pound on the preference water capital has been returned, or is about to be returned, accordingly. But the assets are insufficient to enable the preference water capital to be returned in full; and no means exist of cancelling the water capital. In order to facilitate the raising of additional gas capital, it is expedient that the water capital should be cancelled. Therefore it is proposed by the Order that the ordinary water capital and the preference water capital shall be cancelled, and the provisions of the Acts of 1901 and 1912, so far as they relate to water capital and the borrowing powers in respect thereof, be repealed. Also that any surplus of the assets of the water undertaking, after providing for the return of 3s. in the pound to the respective owners of preference water capital and the payment of the costs of the Order and the other liabilities (if any) of the Company in respect of the water undertaking, shall be distributed among the persons who, at the commencement of the Order, were the holders of preference water capital rateably in proportion to their respective holdings. Further it is proposed that section 15 of the Act of 1901 shall have effect as if the section had been enacted as follows: "The capital of the Company shall be £35,600 (in this Act called 'the gas capital') of which £13,320 is in this Act called the original gas capital, and £22,280 is in this Act called the additional gas capital, and the original gas capital shall be divided into £7800 'A' gas stock and £5520 'B' gas stock. The 'A' and 'B' gas stock shall respectively be deemed and taken by virtue of this Act to be ordinary stock fully paid." [*Parliamentary Agents: Messrs. Sherwood and Co.*]

Further works and capital are the main purposes for which the Thirsk Gas Company have lodged an Order. Lands are mentioned in a schedule on which it is desired to construct additional gas-works, and authorization as to land purchase by agreement is sought. Extra capital sanction to the amount of £9000 is wanted, with power to borrow on mortgage a further sum not exceeding £1000 in respect of the capital authorized by the Act of 1871, and up to one-third part of the new capital authorized by this Order. On the ordinary additional capital, the dividend is limited to 7 per cent. per annum, and on the part raised as preference to 6 per cent. The standard illuminating power of gas is proposed to be 14 candles. The Order incorporates a large batch of clauses (including a stand-by one) of quite the normal form. [*Parliamentary Agents: Messrs. Rees and Freres.*]

SCOTTISH PROVISIONAL ORDERS.

COMING now to the Draft Provisional Orders which have been deposited in the Scottish Office,

The first to be noticed is that of the Cowdenbeath and District Gas Company, Limited. The Company seek to be dissolved and re-incorporated, and to have additional powers conferred upon them. Following the dissolving and re-incorporating provisions, is the general purposes clause, which intends to enact among other things that the Company "may convert, provide, produce, manufacture, sell, dispose of, and deal in, gas, coke, tar, and all other residual products resulting from the manufacture of gas." It is proposed that the capital shall be £80,000, whereof £40,000 is the original capital and the other moiety the additional capital for which authorization is sought. The proposed standard rates of dividend are 10 per cent. on the original capital, 7 per cent. on the additional ordinary capital, and 5 per cent. on the preference capital. Including the £6000 already borrowed, the Company ask for borrowing powers up to one-third part of the paid-up capital. Lands and works powers follow. Very fair protection clauses have already been agreed with the North British Railway Company. In using the bridges or property of the latter, the Gas Company are to obtain the reasonable approval of the Railway Company's Engineer, and are to carry out the work at their own expense. If the Railway Company at any time require the diversion or alteration of the mains, the work is to be executed at their expense, and to the reasonable satisfaction of the Gas Company's Engineer. The contemplated standard price of gas is 4s. 6d., with the sliding-scale operating on the usual terms. The charge for public lighting is not at any time to exceed 4s. 3d. The Company propose the substitution of the calorific value standard for the illuminating power one, on the "Model Clause" terms. Embraced in the Order, among many other ordinary clauses, is a stand-by one referring to electricity and power gas. [*Parliamentary Agents: Messrs. Martin and Co.*]

By reason of the prosperity of the gas business, the Forfar Corporation have exhausted their borrowing powers. They now ask for additional authorization up to £20,000, and the right to raise such money as may be necessary to defray current annual expenditure, until the "several rents, rates, and charges" leviable by them are collected up to two-thirds part of the revenues of the year then currrent. It is proposed that the standard illuminating power of the gas shall be 14 candles. Among a large number of miscellaneous clauses, the Corporation ask by the Order for power, "in addition to their recourse against the actual consumer, to charge and recover from the tenant of any house who sublets his house furnished for any period not exceeding two months the amount of rates and charges for gas used and consumed, and any other sums due to the Corporation by such sub-tenant during such sub-tenancy." Other clauses are designed so as to permit the making of differential charges, the demanding of prepayment for gas for a period of three months or shorter period, the purchasing of waggons and trucks for the purposes of the transport of gas-works materials, and the granting of allowances to aged, disabled, or infirm employees, as well as to dependants of employees serving with His Majesty's forces in time of war or emergency. [*Parliamentary Agents: Messrs. Robertson and Co.*]

In a short Order, referring to sundry improvements, the Glasgow Corporation are contemplating power to construct a bridge over Adelphi Street, commencing within the Dalmarnock Gas-Works on the south side of the street and terminating in the works on the north side of the street, together with all necessary buildings, works, machinery, and apparatus connected therewith or incidental thereto. The new works are to be deemed part of the gas undertaking, and are to be completed within five years of the passing of the Act confirming the Order. [*Parliamentary Agents: Messrs. Martin and Co.*]

In an Order (dealing more particularly with water matters) promoted by the Lanarkshire County Council, there is a part making further provision with reference to the supply of gas within the county. It is proposed to amend the Burghs Gas Supply Act by providing that a district committee of the county who have adopted the Act within two or more special lighting or other districts within their jurisdiction may amalgamate or combine any two or more of these districts for the purposes of gas supply. Other provisions confer all the powers of supply within the combined districts. Report is to be made to the County Council of any capital expenditure incurred, in order that the Council may allocate to each district such proportion thereof as may appear to them just and reasonable. The expenses of managing and maintaining the gas undertaking, including depreciation and renewal fund, is to be allocated to each district annually in proper proportions, having regard to the cost of distribution, consumption, and other circumstances. The price in each district is to be fixed at such figure as will be sufficient each year to discharge all obligations. [*Parliamentary Agents: Messrs. Grahames and Co.*]

An Order deposited by the Port Glasgow Corporation refers (in addition to the extension of the burgh) to the construction of new gas-works, the acquisition of additional lands for the purpose, and the conferring of further powers in relation to the undertaking. The new lands are described in one of the schedules; the period for their compulsory purchase being limited to three years. Powers for the construction of new works succeed the land clauses. Then authorization is sought to purchase by agreement the property of the Langbank Gas Company. Power is desired to supply gas for heating, cooking, and trade purposes on agreed terms and conditions, provided that the rate charged is the same to all persons under like circumstances. In substitution of the illuminating power standard, a calorific standard is sought, on the lines of the "Model Clause," save that 550 B.Th.U. is the proposed standard. But in respect of total heat value, the average of two testings in one day in the event of the first testing giving a deficient result, the 7½ per cent. margin, and penalties, there is conformation with the model. A stand-by clause and the old discounts provision appear. We get the following variation from the ordinary prepayment meter clauses.

> The Town Council may demand for any gas supplied through a prepayment meter a not greater charge than for gas supplied to private consumers within the limits of supply through any other kind of meter or by any other method of supply.
>
> The charge for the hire of any prepayment meter and fittings to be used therewith shall be a sum of money calculated according to the quantity of gas supplied through such prepayment meter; and the maximum sum to be so charged shall be at the rate of 10d. per 1000 cubic feet supplied in manner aforesaid, such sum to include the hire of meter and the fittings used therewith.
>
> The said charge shall include the providing, letting, fixing, repairing, and maintenance of the meters and fittings, and the cost of collection and other costs incurred by the Town Council in connection therewith.

The succeeding clause proposes to impose upon the prepayment meter users liability for both meter and money therein. It reads:

> Every consumer of gas supplied by the Town Council through a prepayment meter shall be responsible for the safe custody of such meter while the same is in the premises occupied by him, and for all moneys from time to time deposited therein, until the collection thereof by or on behalf of the Town Council, and shall be liable to the Town Council for all damage caused to such meter, and for all loss by or through the wrongful abstraction of moneys therefrom, while such meter is in the premises occupied by him as aforesaid, unless some person other than such consumer is prosecuted in a court of law for wilful damage to such meter, or for the theft of moneys therefrom, and every such meter at the commencement of this Order in the premises of any such consumer shall be deemed to have been placed therein, and to continue therein, subject to the provisions of this section.

Another unusual clause for English Bills and Orders, but common to Scotland, is found later on for "preventing wilful waste of gas." It reads:

> If and whenever any person supplied with gas by the Town Council wilfully does, or causes or suffers to be done, anything in contravention of any of the provisions of this part of this Order, or wilfully fails to do anything which under this Order ought to be done for the prevention of waste, misuse, or undue consumption of gas supplied by the Town Council, the Town Council may cut off or stop any pipe by or through which gas is supplied to him, and cease to supply him with gas so long as the cause of the injury remains or is not remedied, and also may recover in any Court of competent jurisdiction from every person so offending the amount of all loss, damage, or injury which the Town Council may sustain by reason of any such thing or failure; and the remedies of the Town Council under this enactment shall be in addition to their other remedies in that behalf.

Borrowing powers to the amount of £70,000 are sought. [*Parliamentary Agents: Messrs. Beveridge, Greig, and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

THERE is no doubt the London County Council are getting a little bit concerned over the signs of hostility to their electricity supply scheme that are popping up all over the Metropolitan area and the extensive environment the Council, through their *protégé* Company, are proposing to take under their electrical wing. The Council still think that their plan of regenerating the electricity supply of London, which plan is the product of eighteen months' investigation, is far and away the best. But for what they have done, and are proposing to do, no one appears to be in the least grateful. Now, as was pointed out in the "Memoranda" last week, they are in a quandary. To their scheme there is a mass of antagonism, which is daily growing larger. They have admitted the correctness of the principle of company management, and have agreed as to its superiority over municipal trading administration. Ten Companies have since placed on the table an alternative scheme. The Council from every aspect are not for their own comfort in an enviable position. One indication of their doubt is supplied by three questions they have submitted to the Metropolitan Borough Councils, inviting from them specific replies. The reputed idea of the interrogatory communication is to try to do something to make the Council Bill as non-contentious as possible. It is certain, of course—the ten Companies' Bill shows it—that the Council will not get the support of any one of these potential factors in the supply reorganization situation. However, the three questions submitted to the Borough Councils are these:

The Gathering Forces.

> (1) Is the Borough Council in favour of any attempt to establish a more uniform system of electricity supply throughout London and adjoining districts?

(2) Is the Borough Council in favour of the establishment of a central bulk undertaking, from which the local undertakings can be supplied if and when required?

(3) In view of the advantages, both immediate and ultimate, which the scheme offers to the London undertakings, individually and collectively, upon what terms will the Borough Council be prepared to support the Bill?

The Borough Councils do not appear prepared to get entangled in the web so deftly prepared for them by these questions. The putting forward of the questions is only another example of the muddled way in which the Council have been prosecuting this movement from its very inception. They do not appear to have taken the trouble to have preliminary consultation; consultation has come after the scheme has been pushed forward in its cut-and-dried state. To answer the questions specifically might, in the event of an ultimate determination to oppose the scheme, put any Borough Council completely out of court. The answers to the questions would make fine cross-examining material when the Borough Council witnesses were before the Parliamentary Committees. The Hammersmith Borough Council supply an example of the cast-iron antagonism that exists towards the scheme; and so do the Marylebone Council. This body and their Engineer (Mr. A. H. Seabrook) cannot see any virtue in either the Council or the Companies' scheme. As a matter of fact, the Standing Conference of Metropolitan Municipal Electricity Undertakings has passed a resolution to the effect that the County Council scheme is prejudicial to the development of electricity supply in London and to the interests of the Borough Councils owning electricity undertakings, and contrary to the interests of the ratepayers. This resolution does not leave much room for hope of any of the supplying Borough Councils forming an alliance with the County Council. In fact, one of the Councils—the Southgate—appears to have got a bit savage over the Bill when it was formally introduced to the members; for, according to the "North Middlesex Chronicle," the Council received it "with menacing growls, and condemned it by implication." How dreadful!

Contractors up in Arms.

It was mentioned on a previous occasion that certain Bills containing electricity clauses which are being promoted by local authorities in the current session incorporate fittings and hiring provisions. The local authorities are not likely to get these through with the electrical contractors sitting idly by. The latter do not mean to voluntarily relinquish any part of the advantage they have so far obtained in their tussles in and out of Parliament with the municipal authorities; and the experience the Sheffield contractors have had with the Corporation of the city is not calculated to make things easier or more pleasant for other local authorities in trying to arrive at some compromise with the representative body of the contractors. The contractors always appear willing to initially discuss matters, in order, if possible, to avoid expensive contest. They are going diplomatically to work at Edinburgh, the Corporation of which city are promoting a Provisional Order to confer, among other things, powers to supply on hire all electrical apparatus (except for lighting), to fit up such apparatus, to carry on show-rooms, and to use public money for advertising and promoting the business. The contractors do not approve of this spreading of the trading net; and they have made representations to this effect to the Corporation. They also urge that, owing to the crisis, this is not a suitable time for the introduction of the proposal. But the real objection lies in the statement that "no private industry can live against rate-aided competition, as it is not fair trade." The result of the protest has yet to be developed; but the protest itself shows which way the wind is blowing. What is going to happen at Sheffield is not particularly clear. The probability is litigation to interpret what appears a very clear point. The compromise effected after the Corporation were beaten in the Law Courts, and found their Bill in jeopardy when last in Parliament, distinctly gave them the right to wire houses to the ceilings or walls, and the dealing in fittings was to be left in the hands of the contractors. Now the Corporation want to run a municipally controlled fittings business, with the contractors bound to them by municipally devised regulations and terms. The contractors do not like the idea; and we do not blame them for sticking to the pledges made on both sides with the view to reconciliation and peace. The "Sheffield Telegraph" has spoken outright on the matter. Among the gems in its protest against the attitude of the Corporation is this: "Since the compromise was arranged, the Corporation have been trying every possible dodge and subterfuge in order to evade it—a deplorable spectacle unworthy of a city of this importance." The high-handed manner in which the Corporation have been dealing with the matter suggests that they have been harbouring the belief that they had right and all the independent public opinion on their side. It must have been a rude shock to them to find they had not.

Under the Table.

Nearly every week produces a fresh discovery as to the disadvantages of the electric-cooker either in regard to purpose or field of application. Of those rather circumscribed residential places known as "flats," the gas-cooker is a very fashionable and favourite labour-saving, economical appendage, which yields broad service in many ways. But a correspondent of the "Electrical Times" has found that a frequently recurring obstacle to the adoption of the electric-cooker in flats is the lack of room. We incline to the opinion that the "obstacle" is really an excuse on the part of those people who refuse to come under the same appellation as is applied to their residences. However, the correspondent in question makes the sage suggestion that the floor-space under the kitchen-table should be turned to account in affording suitable accommodation for the electric-cooker. We get some fun out of the wrestlings of the electrical people with all their little worries. Just fancy the housewife or the cook crawling about under the kitchen table, and knocking her head and disarranging her hair on the latter, during the process of cooking the dinner, or preparing breakfast or luncheon! However, the "Electrical Times" gives serious consideration to the proposal, and arrives at the intelligent conclusion that it does not regard the position as suitable or desirable. But it goes on to submit an alternative—that the difficulty could be surmounted by employing a light form of cooker such as the "Tricity," the "Credenda," or the "Venner," and that it would be quite an easy matter to keep it under the table when not in use, and then place it on the top or on a bench when cooking was going forward. Looking at the matter from a practical point of view, we should fancy that, when cooking was in progress, all the room that could be found on a kitchen table in a flat would be required for the work associated with the preparation of the meal; and as to the "bench"—well the kitchen in a flat does not give much spare space for the provision of benches. Another trouble associated with the movable electric-cooker in a flat is provided by the flexible connections. They are ugly things to trip over, and ugly things too when abrasion or heat has destroyed part of their insulation. But the suggestion is made that, if the idea is adopted of storing the cooker under the table, and giving it a more elevated position when cooking is proceeding, cable protected by metallic flexible tubing or cab-tyre flexible cable could be used.

Steam v. Gas.

There has been frequent mention in the "JOURNAL" of the fact that the Accrington electricity station has been converted from steam to gas driving; the gas being obtained from producers, with bye-product recovery. No. 3 gas-producer has lately been brought into operation; so that it is evident that on these lines it is intended to continue the necessary extensions of the station. To show the fuel economy of the new plant, the electrical engineer states that the cost for the steam plant was 0·379d. per unit generated, and for the gas plant, 0·273d.—a saving on fuel alone of 0·106d. These meagre particulars are published in one of the electrical papers; but they leave much to be desired in the way of information. We should like to know what the figures include, and what were the per ton prices of the fuel. The 0·273d. for the producer gas per unit of electricity, it is taken, is the net figure for coal, after deducting the amounts received for residuals. But we imagine our Accrington friend, with war values for residuals, will not be able to make such a good showing. Still for normal times the figures advanced make one wish to know more about them.

A Case for the Psychical Research Society.

In some retrospective notes in the Commercial Section of the "Electrician," the writer says: "Now we see only in a glass darkly; but when on the conclusion of peace we see things clearly, we shall realize the degree of stability and stamina which has sustained the body commercial during the period of the war. It may be that even our *ancestors* will marvel that the strain, the wearing, nervous strain of the war, could have been borne with such fortitude, equanimity, and resource, and with so little effect upon the everyday routine of the industry." This is surely a case for the Psychical Research Society. It would be extremely interesting to get the views on the present condition of things of such ancestors as Wellington, Nelson, and a few other departed national heroes and long-past military and naval experts. The matter, however, is one that must be left to those who know more about these things than we do. It would seem that the "wearing nervous strain" of the war is having a sad effect in some quarters.

"Let Us Forget."

It is sometimes cruel and inconvenient to be reminded of one's past actions. A few days ago there were brought to mind certain harrowing nights that our friends of the "Electrical Review" had in the year 1913. It may be remembered that this uncomfortable experience happened after the terrible railway disaster at Aisgill; and probably after a nightmare, and with sleep-unrefreshed brains, our friends gave vent to the following piece of melancholy hysteria:

Lest we forget! Oh! that we could forget Aisgill! Oh! that we might for once shirk our duty and refrain from again perusing the ghastly details of one of the most heartrending and pitiful of the "avoidable" catastrophes which have blackened the pages of British railway history. That we might wake up to find it to have been a distressing nightmare! That we might close the book and say: "What a very sensational piece of holiday fiction! But it cannot be!"

And it was all over the fact that two out of three destroyed carriages were gas lighted, and only one electrically lighted! We have had occasion since to notice the singularly diverse effects of accidents on our contemporary's mind. When great catastrophes have been originated by electrical causes, the same personal disturbance has not succeeded the event. It did not after the life-destroying catastrophe in the Senghenydd mine. We never

learned from our contemporary, in regard to the Aisgill disaster, whether any sedative result followed the report by Major Pringle, that in his opinion there were two fires—one caused by gas, the other by the live cinders from the ash-pan of the engine; but the former was successfully coped with. Our contemporary had prejudged the matter; having stated that, owing largely to the presence of gas on the train, several persons were burned to death. The "Review" proved itself more than technically weak in regard to high-pressure gas on that occasion. The matter has been recalled to mind by the recent occurrence on a tube railway in New York; and we have been carefully watching to see whether the nerves of the same "Review" writer have been upset by the sad event. If visible signs enable us to judge, they have not been. The trouble was due to an electrical short-circuit. This may account for the placid state in which that writer finds himself. One report said that "many" persons were killed, that 300 were temporarily asphyxiated by smoke, and that it was the most disastrous underground accident that had ever occurred in New York. Another report alleged that only one passenger was killed. However, train-loads of passengers were trapped in the tube, through the shutting-off of the current. In the darkness and impenetrable black smoke, a panic ensued. Eventually frenzied, struggling, fainting masses of humanity in the tube trains were rescued by firemen. The article in the "Review" in 1913 was headed "Lest We Forget;" a suitable title for another article in the evident present frame of mind of our contemporary would be "Let Us Forget."

Death in the Mine.

In the annual report on Mines and Quarries for 1913, Mr. Robert Nelson, Inspector of Mines, gives some information as to the fatal accidents that occurred in mines due to electricity. Investigated during the year were fifteen such accidents; these causing sixteen deaths. In addition, a fire in the Big Pit of the Blaenavon Iron and Steel Company was held by most investigators to have been due to the failure of an electric cable. The terrible happenings, too, in the Senghenydd Colliery were, it was impossible for the Commissioner to avoid the conclusion, due to sparks from an electric-signalling apparatus. The Inspector looks with disappointment upon the fact that the number of deaths from electric shock below ground again shows a rising tendency. It was thirteen in 1909, fifteen in 1910, nine in 1911, seven in 1912, and thirteen in 1913. Of the 50 electric-shock accidents causing injury to 51 persons which were reported during the year, 30 caused injury to 30 persons below ground, and 20 caused injury to 21 persons at the surface. Of the 51 persons injured, 43 were disabled for more than seven days. In three cases the victim was unconscious for some time; artificial respiration being successfully applied in all cases. In four other instances, the victims were seriously injured by burns. Between Jan. 1, 1905, and Dec. 31, 1913—a period of nine years—electric shock below ground has been responsible for 83 recorded accidents and 86 deaths. Of these, 37 accidents (causing 40 deaths) were due to contact with outer coverings of apparatus rendered live, through the absence of, or an inefficient, earth connection; and 32 accidents and an equal number of deaths were due to defective insulation of cable systems. Three underground fires were reported as having been due to electricity in 1913. Leaving Mr. Nelson's documentary evidence as to the use of electricity in mines not being all it should be, it is noticed that the report of Mr. S. Pope and Mr. T. H. Mottram on the explosion which took place at the Wharncliffe Silkstone Colliery on May 30 last endorses the finding of the Coroner's jury that the explosion was caused by "the stoppage and re-starting of the fan with a defective coal-cutter running at the face."

LOCAL GOVERNMENT FINANCE.

Summary of the Local Taxation Returns.

ALTHOUGH now somewhat belated, it is necessary to take brief notice here of Part VII. of the Annual Local Taxation Returns for the year ended March 31, 1912, which consists of a collective summary and index of the information contained in the earlier volumes, some of which have been referred to, as issued, in the pages of the "JOURNAL." The Blue-Book now published concludes the forty-second annual series of returns compiled by the Local Government Board, in connection with the accounts of the local authorities of England and Wales.

The total number of the separate authorities embraced by the definition set down for the purpose in the Local Taxation Returns Acts, who had financial transactions during the year 1911-12 is 25,453. This is counting only once those of them that made separate returns respecting their transactions in different capacities. The affairs of the Metropolitan Water Board are dealt with in a separate parliamentary paper. The receipts quoted in the present summary include the sums received by local authorities from Exchequer grants towards expenses incurred in respect of elementary education, as well as the gross receipts from water, gas, electric lighting, tramways, and other undertakings carried on by them, and miscellaneous receipts from rents and sales of property and repayments on account of work done for private individuals. Money borrowed to meet capital expenditure is distinguished from other sums. The expenditure included is that which has been defrayed out of the receipts mentioned. The number of local authorities who had expenditure (other than that defrayed out of loans) during the year 1911-12 in respect of water supply was 1185, of gas supply 230, of electric light supply 246, and of tramways and light railways 174.

The total amount of public rates received in the year under review was £66,368,704, of which 24 per cent. was collected in areas in the Administrative County of London. The receipts also included £22,269,629 from Exchequer grants (including local taxation duties), £27,548,787 from gas, water, electric light, and tramway and light railway undertakings, and £20,101,445 from other sources. At the commencement of the year 1911-12, the total of the gross value or gross estimated rental of the rateable hereditaments in England and Wales was £272,249,125; the total rateable value was £218,588,250; and the total assessable value for the Agricultural Rates Act was £206,691,676. Taking England and Wales as a whole, the gross value or gross estimated rental increased between the commencement of the year 1910-11 and that of 1911-12 by £2,306,870, or 0·9 per cent.; and the rateable value by £1,408,066, or 0·6 per cent. The average amount of public rates per pound of assessable value for the year 1911-12 was 6s. 5·06d., as against 6s. 4·16d. the previous year, or an increase of 0·9d. When calculated upon the estimated population, the amount per head was £1 16s. 8d., compared with £1 16s. 5d., or an increase of 3d.

In the year now being dealt with, the loans raised by local authorities amounted to £17,750,064, which was smaller than the sum raised by them in any year since 1897-8, and was less than that raised in 1910-11 by £475,758. The amount of loans received during the year for gas-works was £379,087, as compared with £382,959 the preceding year; for water-works, £2,347,961, against £2,531,077; for electric lighting, £1,476,042, against £1,309,582. The figure relating to the amount of loans outstanding differs considerably in the present Blue-Book from what it has been on previous occasions. This, however, is due to an alteration in the way in which the statistics have been arranged. Hitherto it has been the practice to treat the part of the London County Council's sinking fund remaining invested in securities issued by other local authorities, not as so remaining, but as having in effect been applied in redemption of debt. But this practice, which was not followed in the case of any other local authority, has now been discontinued. The effect has been to increase both the outstanding debt and the amount remaining in sinking funds by a sum of practically £12,000,000. When the comparison with the preceding year is made on the same basis as before, it is seen that the outstanding loans increased during the twelve months by some £4,000,000. The total amount of loans outstanding at March 31, 1912 (including £49,650,207 for the Metropolitan Water Board), was £556,571,139; and the amount standing to the credit of sinking funds and other similar funds applicable towards the repayment of such part of this sum as was repayable out of these funds was £34,698,678.

As to this outstanding loan account of £556,571,139 at March 31, 1912, it may be mentioned that the relative proportions in which the amount was distributed over the various purposes for which it had been borrowed were as follows: Baths, cemeteries, electric lighting, gas-works, harbours, piers, &c., markets, tramways and water-works, £307,437,108, or 55·3 per cent. Education accounted for 9 per cent.; highways, bridges and ferries, and sewerage and sewage disposal works, for 19·3 per cent.; and other purposes, for 16·4 per cent. The first item may be further divided up, when it is found that £22,667,099 relates to gas-works; £130,093,989 to water-works; £29,778,166 to electric lighting. The average amount per pound of rateable value, over England and Wales, of the total loans outstanding at March, 1912, was £1 8s. 2d. for undertakings which are said to be revenue bearing, and £1 2s. 10d. for loans for all other works and purposes. The average amounts per head of the estimated population were respectively £8 10s. and £6 17s. 9d.

The total receipts of the local authorities, excluding loans, in 1911-12, amounted to £136,288,565; and the following are some of the items which went to make up this amount: Gas-works, £8,028,560; water-works, £5,350,392; electric light undertakings, £4,382,300. The gross revenue (in which are included sums received by local authorities in respect of undertakings leased by them to companies and others, with interest on sinking fund investments) of the gas undertakings carried on by these bodies, it is pointed out, rose from £7,854,716 in 1910-11 to £8,081,232 in 1911-12. In the case of electric light undertakings, the gross revenue increased from £4,060,682 to £4,424,775—sums received for power supplied to the authorities' own tramway undertakings not being included in these amounts. The increase in the case of water undertakings was from £5,222,241 to £5,438,223. The total receipts of local authorities, from all sources other than public rates, Exchequer grants, and loans, were £47,650,232. The expenditure, excluding loans, was £134,073,327; and among the items there may be mentioned the following: Gas-works: Maintenance and all other expenses not being loan charges £5,736,957; loan charges, apportioned as far as practicable, £1,558,932; total, £7,295,889, or 5·4 per cent. of the total expenditure. Electric lighting (other than public lighting): Maintenance and other expenses, £1,736,742; loan charges, £2,478,682; total, £4,215,424, or 3·1 per cent. Lighting streets, roads, &c.: Maintenance and other expenses, £2,265,301; loan charges, £21,983; total, £2,287,284, or 1·8 per cent. Water-works: Maintenance and other expenses, £2,001,350; loan charges, £3,719,839; total, £5,721,189, or 4·3 per cent.

ELECTRICAL POWER PLANTS IN GAS-WORKS: THEIR CHOICE, INSTALLATION, AND OPERATION.

By a "Gas-Electrical" Engineer.

(*Continued from p.* 81)

The Use of Accumulators.

The storage of electrical energy by means of accumulator storage batteries has, like all things electrical, been of late the subject of much controversy—its opponents condemning it as being inefficient and useless, while its supporters claim that no generating plant is complete without such an installation. It is an admittedly inefficient apparatus, but it has its sphere of usefulness; and, given reasonable care, there is no reason why it should be considered more unsatisfactory than the other units of the plant of which it forms a part. The difficulties met with in installations of this type depend entirely upon the extent to which the maker's instructions are carried out—always assuming that a good make of cell is laid down. In a power plant of the type which forms the subject of this article, a judiciously rated set of accumulators will be found to contribute largely to the maintenance of low running and maintenance charges.

On all gas-works there occur during the twenty-four hours perfectly regular intervals of light load when it is essential to keep the distribution network alive, but during which the actual output is so light as to necessitate a comparatively large set being run at a most uneconomical load. At such times the load can be advantageously carried by a set of accumulators, and the main engines shut-down. All prime movers are wasteful at light loads, and this procedure eliminates a source of serious loss caused by running comparatively large sets on a load which, at perfectly regular periods and for fairly long intervals, must be ridiculously light.

When the main plant is running, the battery is connected-up in parallel with the generators, when it is said to be "floating" on bus bars; its general effect being to exercise a steadying or cushioning effect on the main generators and to minimize the momentary pressure variations which must occur even with compound wound dynamos, particularly on works where electric cranes, capstans, telphers, or retort charging and discharging machinery is used. The battery automatically responds to all load variations. At periods of normal or high pressure it would draw a charging current from the machines, while at times of heavy demand the cells would supply power to the feeders and help the machines over peak loads. It will be readily seen that its general effect is to maintain a higher load factor on the generating sets than would otherwise be possible by providing a charging load for the main generators at a time when they would otherwise be running at a low, and hence an uneconomical, load factor.

In power installations where it is not permissible to alter the bus bar pressure for the purposes of charging the cells, there is a usually "booster," which consists of a motor-driven dynamo connected during the charging period in series with the battery. The pressure of this dynamo, added to the bus bar volts, creates an electro motive power which opposes and overcomes the pressure at the battery terminals and sends a charging current through the cells.

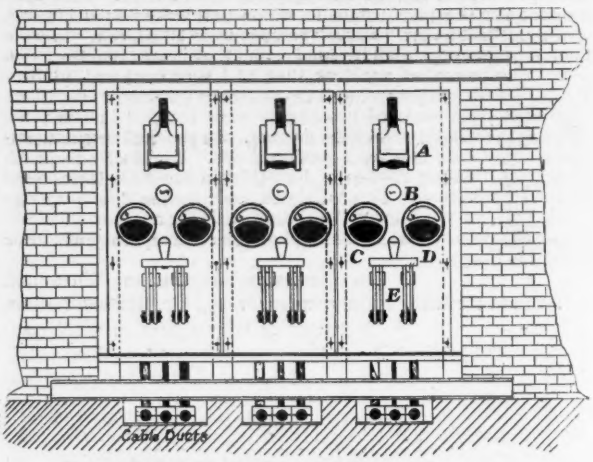
The employment of accumulators is particularly desirable where motor-driven exhausters are employed on account of their "cushioning" characteristics when load variations occur. The capacity of a battery is expressed in ampere-hours, and is a measure of the current given out by the battery multiplied by the number of hours over which it will safely give that rate of discharge. Capacity depends upon the area of the plates; but for mechanical stability and general convenience it is usual for this area to be obtained by the employment of several comparatively small plates connected in parallel with each other. The pressure per cell is always about 2 volts; a number of cells being connected in series so as to obtain the required pressure.

It is usual to enter into a maintenance agreement with the makers of the batteries, under which the battery is maintained in an efficient condition at an annual charge of from 5 to 15 per cent. of its original cost—the rate varying according to the value of the battery, its situation, and the conditions under which it is used. The installation of a battery as an actual stand-by cannot be regarded in the light of a sound proposition from either a commercial or an engineering point of view. This practice would involve the installation of a large and expensive set of accumulators, the sphere of usefulness of which would in any case under such conditions be limited to a few hours, and the cost would most probably exceed that of a generating set of equal continuous output.

The Switchboard.

In many private generating stations it is a regrettable fact that, although a large amount of thought has been expended on the generating machines, the switchgear has been looked upon as a comparatively unimportant auxiliary, has had no consideration expended upon it, and has eventually been installed in such a manner as to considerably handicap the efficiency as well as the economic possibilities of the entire plant. The output of a plant is concentrated upon, and controlled by, the switchboard; and too great care cannot be expended upon its design.

Switchboard design has greatly improved during the last few years; but it is an undeniable fact that many switchboards of very handsome frontal appearance are, metaphorically speaking, "whited sepulchres," and can only be described as death-traps, in view of the utter lack of uniformity of the back connections and the limited space available for the carrying out of emergency repairs. As regards the material for the panels, the choice will lay between marble and slate. From the insulation point of view marble is, of course, the best; but this is a question that can be disregarded in the case of moderate pressure systems.



A. Reverse Current-Breaker. B. Pilot Lamp. C. Voltmeter.
D. Ammeter. E. Main and Equalizing Switch.

Fig. 1.—Sketch of Dynamo Board flush with Engine-Room Wall.

One of the most important points in switchboard design is the provision of adequate means for cleaning, inspecting, and, when necessary, working upon, the connections at the back of the board. Fig. 1 shows a dynamo board recently installed by the author in which the panels are flush with the engine-room wall, while access can be obtained to the back of the board by swinging open weather-proof doors, as shown in fig. 2. The angle iron framework of this board is solidly built into the cavity caused by the removal of a portion of the wall. The main power board will be divisible into two sections—(1) the generator panels, and (2) the feeder panels supplying the outside network.

Fig. 1 shows the general arrangement of a generator panel. A main quick-break knife switch, ammeter shunt, and a reverse current circuit breaker are placed in circuit on the positive main between the machine and the positive bus bar; while the negative main proceeds straight to the negative bus bar. A volt meter and pilot lamp are connected, *viâ* fuses, across the generator terminals; the purpose of the latter being to partly supplement the volt meter and partly to afford a ready indication as to which particular panels are working.

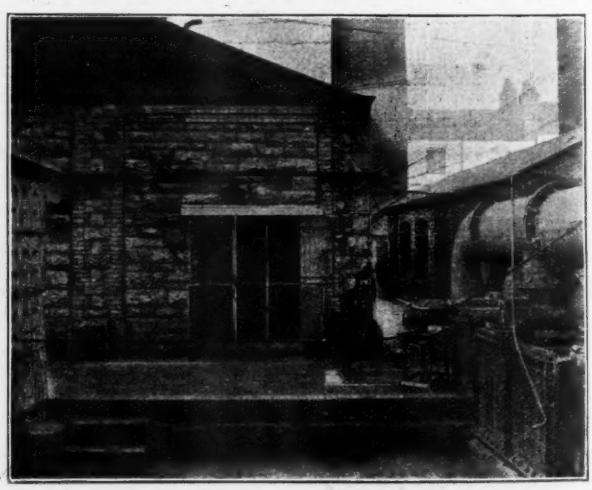


Fig. 2.—Doors giving Access to Dynamo Board.

It will be observed that, although a single-pole panel is shown, a double pole main switch is installed. This switch performs the dual duty of a main switch and an equalizer. One pole is connected on the positive dynamo main, while the other pole makes the equalizing connection, without which it is impossible

to run compound wound generators in parallel. This arrangement is deservedly finding great favour on power boards, and makes this part of the switch-gear absolutely fool-proof; it being impossible to switch a dynamo on the bus bars without at the same time closing the equalizer.

The practice of using reverse current breakers on the generator panels is gaining favour, and has much to commend it. Assuming that each feeder circuit is provided with a good type of overload circuit breaker, it is scarcely necessary to provide additional instantaneous overload protection on the generator panels, as a bad short may throw a generator panel out if they are all fitted with overload switches, and so cause an unavoidable shut-down. In the remote event of an internal fault occurring on one of the machines, a reverse current circuit breaker will disconnect this machine from the bus bars, and so may cause a shut-down, which can only be described as unavoidable; but dead bus bars caused by external faults can, in nearly every case, be prevented by the judicious choice of switchgear.

For the connections at the back of the board aluminium bus bars of suitable section are much preferable to copper, both on grounds of first cost and ease of fitting, and are being extensively used. No cable should be used for making the connections at the back of the board on the main switch gear. The only cables permitted should be the small leads in connection with the pilot lights, volt-meters, and ammeters; and these should be cleated by fibre cleats and kept well away from the connecting links and the framework of the board. Adequate cable ways should be provided between the dynamos and the switchboard. If rubber insulated cables are used, they should be run in stoneware cable racks.

The feeder circuits should be controlled by instantaneous overload circuit breakers, a quick break knife switch, and a shunted ammeter. An ammeter on each feeder gives a continuous check, not only on the motors themselves, but upon the individual units of the plant which they drive. Nothing can go very wrong with a motor driven machine without this fact showing on the circuit ammeter.

Pilot lamps fitted, *viâ* a fuse, between the line side of the circuit breaker and the negative bus bar will enable the plant attendant to observe at a glance whether, during periods of absence from the vicinity of the switchboard, any feeder breakers have fallen.

Single Pole *versus* Double Pole.

In previous paragraphs dealing with distribution switchgear it will be noticed that single-pole switchgear is advocated; and a brief *résumé* of the reasons which dictate this preference may not be out of place. The electrically operated mono-rail telpher is deservedly gaining great favour on gas undertakings; and it is safe to predict that the progressive undertaking that adopts electrical driving will, sooner or later, consider the question of an installation of this type. The addition of a mono-rail telpher to a double-pole insulated system is usually the herald of a bad patch of cable faults, for reasons which will presently become clear.

The girder track on which mono-rail telphers are run usually serves as a return for the negative current, and is electrically bonded (or at least it should be) in precisely the same manner as is the track of an electric tramway system. The portion of the track nearest to the generating station should be connected to the negative bus bar. The negative side of the telpher motors are "earthed"—namely, connected to the frame of the machine, into which the current ultimately passes and finds its way back to the negative bus bar *viâ* the running wheels and the track.

Let us now consider the case of a 220-volt system with both poles insulated. We have one lead at a pressure of 110 volts above earth potential and the other at exactly the same pressure below earth potential. A negative or a positive fault on such a system will at once put the side on which it occurs at earth potential, and at the same time double the pressure between the sound side of the system and earth. This increased pressure will be impressed on every wire, terminal, and fitting on the sound side, and will most certainly lead to a bad breakdown. For this reason alone it is advisable to keep the negative side of a system permanently earthed, and to work the positive side at 220 volts above earth potential; the insulation being better able to stand this constant strain than a normally lower pressure, which, upon the occurrence of a fault, is liable to be suddenly doubled. Each time a telpher used on such a system was switched-on from the main distribution board it would have the same effect as the occurrence of a fault—namely, the pressure between the positive and earth would be instantly doubled.

The connection of the girder on which the telpher runs with the negative bus bar, *viâ* a cable, will have the effect of confining the return current to well-defined and harmless paths—a very necessary precaution in a locality which will probably abound in gas and water pipes. The negative bus bar should be well and permanently earthed, *viâ* an earth plate of ample area buried vertically; and under no consideration should any fuse or other circuit-opening device be placed in any negative feeder. These precautions will ensure the entire negative side of the distribution network being kept at a harmless potential. A link may be inserted between the bus bar and the earth plate, so as to enable the former to be isolated from earth for testing purposes. A low reading ammeter, having a large capacity shunt, may be inserted in the circuit for the purpose of observing the earth current—namely, the current which finds its way back to the station *viâ* the earth plate. With the arrangements above described this should be practically *nil*, and any reading on the ammeter will indicate the existence of a fault on the network.

Transmission.

The problem of a cheap, and at the same time efficient, system of power transmission is one that must present itself to every power plant owner; and the policy of using high-priced conductors without some compensating advantages as regards economy is not likely to lead to progressive results. When local conditions justify their employment—as is decidedly the case in gas-works—aërial lines are the best and cheapest means by which electrical energy can be transmitted; and the gas-works engineer who is laying down a distributing network cannot do better than instal a system of overhead aluminium cables between his power-house and the various units of his plant. This type of conductor has come considerably to the front during the last few years, and is used extensively on the Continent, in Canada, and the U.S.A., for high-tension long-distance transmission schemes—spans up to 600 feet being common practice in these countries.

Aluminium admittedly has a higher specific resistance than has copper; and this necessitates the employment of wire of greater cross sectional area than would be necessary if the latter were employed. Notwithstanding this fact, however, the weight of a given transmission line can be reduced by one-half, and its cost by more than one-third, by the substitution of aluminium for copper. These lines are particularly suitable for use under the atmospheric conditions prevailing in the vicinity of a gas manufacturing plant, due to the immunity which aluminium enjoys from the attacks of sulphur and ammonia vapours. Upon exposure to the atmosphere, a thin insoluble film of oxide forms upon the surface of the aluminium and tends to protect it from corrosion.

The conductivity of aluminium is 60 per cent. that of copper; so that a current density of 600 amperes per square inch in a cable of this metal will be equivalent to the old 1000 amperes per square inch rule for copper conductors. It may be pointed out, however, that an aluminium conductor, due to its increased diameter, has a much greater radiating surface than has a copper cable rated upon the same C^2R basis, and can thus carry a larger overload than can a copper cable for a given rise of temperature. This characteristic gives an aluminium cable a great advantage where current carrying capacity is of more importance than fall of potential, and particularly in cases where a feeder breakdown may necessitate the overloading of an overhead line for a considerable length of time. The formula usually employed in the straining up of overhead wires is

$$T = \frac{L^2W}{8d}$$

Where—

L = distance from point to point of suspension.
W = weight in pounds of wire per foot run.
d = sag in feet at centre of span.
T = tension in pounds.

The formula, however, takes no account of the elasticity of the conductor, which, by allowing the wire to stretch, reduces the strain, and which, in itself, constitutes a factor of safety.

The British Board of Trade specifies a factor of safety of 5 for lines under their jurisdiction (thus limiting the theoretical stress on the wire to 6000 lbs. per square inch), allowing for a wind pressure of 30 lbs. per square foot × ·06 on the projected area of the cables. Wind pressure, it may be said, is taken as a force acting at right angles; and, combined with the weight of the conductor, the resultant stress is

$$S = \sqrt{W^2 + p^2}$$

Where—

S = total tension
W = weight of wire per foot run
p = effect in wind pressure per foot run.

Many installations are carried out with single braided and compounded aluminium cable. But this, like a bare conductor, cannot be led into any apparatus, and the ends of aluminium transmission lines should be connected to insulated copper cables, by means of which the current may be taken into switches, fuse boxes, &c. These connections should all be made by means of mechanical clamps. In this respect it must be remembered that galvanic action may, by the presence of moisture, be set up between aluminium and any of the common metals, and must be guarded against in bimetallic connections by the clamps being taped well over and painted, and so protected from the ingress of moisture. A survey of the works will indicate the routes to be taken by the majority of the feeder lines, and insulator brackets should be placed along this route of a sufficient capacity to take the maximum number of lines it is estimated will be required.

The remote ends of the various feeder lines should be linked-up wherever possible by means of interconnector lines, so as to provide ready means for isolating any particular cable for repair and inspection without shutting-down the particular unit of plant which it supplies. The change from one feeder line to another can be expeditiously effected by means of interconnector link panels, which, it may be remarked, should be boxed-up and accessible only to the electrician in charge of the plant. Interconnecting cables between the various ends of the feeder lines are not expensive to instal; while they ensure immunity from cessation of supply due to feeder faults. Overhead wires are not much affected by overloading, and all that is necessary when using the

interconnectors is to set the circuit breaker a little higher on the particular panel that is temporarily carrying an increased load.

Motors: Their Type and Rating.

It is a prevalent practice among many engineers to allow a considerable margin in brake-horse-power when laying down motors, in order to be on the safe side; but it is an undesirable one, and can be overdone. The effect of a moderate overload on a well-designed continuously rated motor is a purely thermal one which such a machine would stand without any resultant damage. If, however, the motors on a plant have been too liberally rated, there exists the following factors to militate against the economical operation of the plant: (1) Capital lying idle; (2) impaired efficiency; and (3) in the case of an alternating current plant, the creation of an unnecessarily low power factor, with its attendant sacrifice of economy.

Direct current motors may be divided into three classes—shunt-wound, series-wound, and compound-wound motors. The shunt wound continuously rated motor is admirably adapted for use with conveyors, elevators, &c., and will be found to give good service under severe conditions. But when speed regulation is required, or the drive is a reversing one, the motor should be fitted with interpoles. For cranes, transporters, charging and discharging machinery, &c., the series type of motor is universally used on account of its heavy starting torque—a characteristic which, it may be observed, makes it an ideal machine for traction work. It should be noted, however, that this type of machine should never be belt-coupled to its work, and should only be used on a load with which it cannot run away.

The series motor is entirely devoid of the governing characteristics of the shunt and compound types, and upon being relieved of its load has a tendency to speed-up until a centrifugal burst occurs.

The compound motor combines the characteristics of both the series-wound and shunt-wound motor. The larger the number of series turns the greater will be the overload the machine will take without sparking, and the greater will be the "no load, full load" speed variation.

A modification of the compound winding is sometimes applied to shunt-wound motors in order to enable them to exercise a heavy starting torque. This modification comprises a light series winding on the main poles which is short-circuited when the starting switch reaches its running notch. This arrangement is useful in cases where the starting is at all difficult or frequent; the motor starting as a compound and running as a shunt machine.

Both shunt and compound motors may be either direct or belt coupled to their load; and in this connection it may be remarked that the writer's experience is that the latter method conduces to low repairs charges both as regards the motor and the gear which it drives. A fast-and-loose drive from the motor pulley is by no means necessary, provided the starting gear is designed to start the motor against its full load.

A belt may be looked upon as a safety device which, by slipping and leaving its pulleys, saves the situation should anything hang-up in the load to which the motor is coupled. It may be supposed that, in these circumstances, the motor fuses would blow. But it must be pointed out that a fuse is practically a circuit-breaker with a thermal time limit, and cannot open a circuit synchronously with the occurrence of an overload. It takes an appreciable time to "blow;" and in the short interval that elapses between the "hang-up" of the gear and the blowing of the fuse the heavy torque exerted by the still "live" motor may very likely cause extensive damage, either to itself or to the gearing of the machine it is driving. This characteristic is particularly noticeable in series-wound motors, and was dealt with at length in an article on "The Care and Maintenance of 'Fiddes-Aldridge' Simultaneous Charging and Discharging Machines" published in the issues of the "Journal" for April 14 and 21, 1914. The author would here venture to suggest that readers who are interested in this particular subject should peruse the above-mentioned article in conjunction with the present one. The totally enclosed motor has many enthusiastic advocates; but the writer regards it as an extreme step to adopt it universally, even in such dusty situations as are common on gas-works. This type of motor is an expensive, bulky machine, and does not lend itself as readily for inspection, cleaning, and maintenance as does the protected type. When operating in purifier and exhauster houses, and in close proximity to gas appliances, totally enclosed gas-tight motors should certainly be used; but where the machine is well away from the possible neighbourhood of an explosive mixture, in a dry accessible position, it is doubtful whether any good purpose is really served by the installation of a totally enclosed motor.

Among the motors under the writer's charge there are a considerable number of protected type motors which have been operating for the past two or three years under theoretically impossible conditions with an utter freedom from mechanical or electrical breakdown, which is entirely due to the fact that, though working in extremely dusty situations, this type of machine lends itself to frequent and thorough inspection and cleaning. The extent to which the electric motor's interior can be kept free from the accumulations of dust and dirt has a great bearing upon its satisfactory work and its life; and it is becoming the standard practice in works using a large number of motors to accomplish this by means of a small portable motor-driven compressor, which delivers air at a pressure of 20 to 30 lbs. per square inch. A great deal can be done with a good air syringe; but in a large plant the initial cost of a small compressor will soon be covered by the time saved in cleaning dynamos and motors, particularly in respect to those situated in cramped and inaccessible places, and by the generally more efficient condition in which, by its use, the plant may be maintained.

(To be concluded next week.)

PROGRESS AT REDDITCH.

A Noteworthy Achievement.

Trades on which the business life of Redditch no doubt mainly depends—motor cycles and needles—are in a thriving condition; and thus a prosperous state of affairs exists, as it has done for a long time past, in the town. In no case, perhaps, is this prosperity more evidenced than in that of the Gas Company, whose output has been going up by leaps and bounds. On the fact that general industrial activity has brought good fortune to them, the Company and their Engineer and Secretary (Mr. A. E. Layton) are to be heartily congratulated. But while so congratulating them, justice demands that due acknowledgment should be made of the energy and foresight that have been displayed by them in both stimulating and meeting the demand for gas. Even the best conditions of trade will not of themselves, and without effort, bring about such increased consumptions as the Redditch Gas Company are able to point to. In order that the works may be equal to the growing requirements, considerable extensions have recently been undertaken; and attention was last week drawn in the advertisement columns of the "Journal" [p. 109] to the claims of the Company from an investment point of view, by an announcement of a forthcoming sale by auction of additional preference and ordinary stock.

The remarkable nature of the progress in the output is strikingly indicated by a chart prepared by the Company showing the annual increase in the make of gas from 1875 onwards. In earlier times, the business grew steadily. There were only three or four years altogether in which a falling off occurred as compared with the preceding twelve months; and even when it did take place, the set-back was only trifling, and was in every instance more than recovered in the year immediately following. By 1905, an annual consumption of 73¾ million cubic feet had been reached, and by 1909 it was 93 millions; while by 1911 the figure had been increased to nearly 113 million feet. Satisfactory as this was, later achievements in piling increase upon increase have been even more gratifying. In 1912, the quantity of gas made was 139¼ cubic feet; in 1913, 151½ millions; and in 1914, 167½ millions. That is to say, for the year ended December, 1914, the make was over 10½ per cent. in excess of that for 1913; while for the five years to the close of 1914, the gain was equal to 80 per cent. With such a record, it is easy to understand that the dividend on the ordinary stock has never fallen below the standard rate—which rate has from time to time been increased under the sliding-scale, by reducing the charge for gas below the standard price fixed.

By way of supplementing what has already been said from the manufacturing point of view, it may be mentioned that the Company, as now existing, was incorporated by Act of Parliament in 1899, when the old Redditch Town and District Gas Company, formed in 1872, was dissolved. There are now about 5000 meters in use in the district; and of these no less than 3800 are prepayment meters—over 3000 of the users of which have cooking-stoves. As the works stand upon freehold land of an area exceeding 5 acres, there is ample room for further extensions, whenever the progressive policy of the Company necessitates them being carried out.

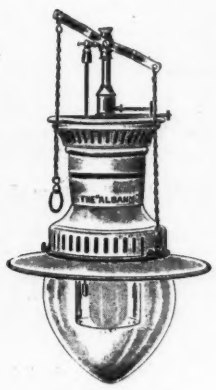
SMITH'S HIGH-POWER LAMPS.

Two New Patterns.

There is just now a little temporary lull, for reasons which can well be understood, in the request for high-power lamps for outside lighting purposes. The exigencies of the situation call rather for the smallest than for the largest practical amount of outdoor illumination, in those positions where one has been accustomed hitherto to see the most brilliant lighting. This, however, may merely serve to stimulate the desire for bright indoor lights—of course, with shop-windows, &c., adequately shaded. A good demand may thus be anticipated for two new patterns of low-pressure high-power British-made lamps suitable for the effective illumination of interiors which have lately been introduced by Messrs. J. & W. B. Smith, of Farringdon Road, E.C.

Both lamps are pleasing in appearance, and efficient in lighting power; being rated at 300 candles, for a consumption of about 7½ cubic feet of gas per hour. As to the "Albany," this is provided with a white vitrified enamelled casing, having gold lines; and, as the illustration shows, is fitted with a reflector. Under the circumstances, the firm point out, they have gone to some trouble to get these enamelled casings prepared. The "New Briton" has no reflector, and is finished in polished brass or oxidized copper. The overall measurement of the complete lamp is 19 inches; it has solid brass drawn tubing throughout; and a

The "New Briton."



The "Albany."

particular point about it is the extra heavy nozzle seating provided. In each case, there is that substantial look about the lamps which is so generally associated with British-made goods.

NEW CARBONIZING PLANT AT CLECKHEATON.

THE Cleckheaton Urban District Council have got fairly to work with their new carbonizing plant at Moorend; and the results are so satisfactory that the Committee have decided to let down the horizontal retorts in the old works at Marsh. The carbonizing system at the new works, on the Woodall-Duckham system of verticals, is capable of producing 750,000 cubic feet of gas per 24 hours. There is one bench containing twelve retorts and four producers, so arranged that a further setting of four retorts can be installed when this should be necessary.

The retort-house is a steel-framed building, the side and gable-end walls of which are formed by filling-in with 9-inch brick panelling. The foundations for the house consist of a reinforced concrete raft over the whole area of the building, so arranged as to distribute the weight of the installation uniformly over the entire area of the ground. The retort-house and parallel coal-store floors are covered with 6 inches of concrete worked to a smooth surface. The coal required for the installation is brought to the gas-works by means of a loop-line running parallel with the main railway line; the contents of the waggons being discharged on the embankment into two receiving-hoppers placed underneath. For dealing with the coke not required for the producers, skips are provided, so that the coke can be discharged into them, and taken out into the yard for disposal. In case of a breakdown to the conveying plant, a lift is provided, and so arranged that skips loaded with either coal or coke may be elevated from the ground-level to the top storage-hopper level.

The responsibility for the whole of the work rested upon the Council's Gas Engineer (Mr. A. L. Jennings), acting in consultation with Mr. William Newbigging, of Manchester. The contract for the carbonizing plant, of course, was in the hands of the Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, of Palace Chambers, S.W.

The Illuminating Engineering Society meet this (Tuesday) evening, at the Society of Arts rooms, Adelphi, when a discussion will take place on "Some Points in Connection with the Scientific Development and Practical Application of Searchlights."

Scottish Junior Gas Association (Western District).—A visit is to take place on Saturday next, to the Falkirk works of Messrs. R. & A. Main. The ordinary meeting of the Association will be held in the Royal Technical College, Glasgow, on Feb. 6, when papers will be read by Mr. Robert Barr, jun., (Kilmarnock), on "Tar Dehydration and Benzol Recovery," and by Mr. A. P. Dale (Beith), on a "Country Gas-Works, Past and Present."

China-Kilns Fired by Gas.—At the last meeting of the American Commercial Gas Association, a paper on "Gas-Fired China-Kilns" was read in the Industrial Section by Mr. T. D. Keyes, of the Denver Gas and Electric Light Company. In the course of it he said: "Most china kilns have been made to use kerosene or gasoline for fuel, and a prejudice against the use of gas seems to have been created and fostered by some china-kiln makers, much against the interest of the gas companies. In Denver we have succeeded in overcoming this prejudice, and in establishing a condition under which gas is practically the only fuel that will be considered for this work. There are now 75 kilns in Denver, nearly all using gas. The consumption, which runs from 400 to 1000 cubic feet for each firing, brings a revenue of from $5 to $25 a month, averaging $10 for each kiln installed. This revenue is mainly from off-peak consumption and from the residence district."

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the members of this Association was held in Bradford last Saturday. The members assembled at the Bradford Corporation Gas Department show-room, Darley Street, under the chairmanship of Mr. Lee, the President.

There was first of all read a short but useful paper by Mr. E. J. Sutcliffe (the Deputy Engineer and Manager to the Bradford Corporation Gas Department), entitled "Descriptive Notes on the Concrete Foundations of a Vertical Retort Installation," the paper being illustrated freely by diagrams and photographs. It appears on p. 142 of to-day's issue. In answer to a question, he said that the coarse aggregate used was mostly broken fire-bricks. The fine aggregate was what was called a minion—being broken slag from the Bowling ironworks, of which there had been an enormous accumulation during the last century, and which he regarded as better than sand for the purpose. The slag was more irregular and rougher and more porous, and to a certain extent the cement got incorporated with it.

A paper was also read by Mr. J. W. Roper, of Bradford [see p. 143], on "Photometry of Incandescent Lamps and Burners." Afterwards the members visited the Mill Street Gas-Works to inspect the process of lamp-testing in actual operation.

On the motion of the Chairman, seconded by Mr. F. Scholefield, a vote of thanks was accorded to the readers of the papers, and also to the Engineer, Mr. Charles Wood, F.C.I., for, as Mr. Lee put it, "what he has done and is doing continually behind the scenes of the Association."

FORMATION OF ANTHRACITE.

At a Meeting of the Leeds Geological Association held at the University last Friday night, Professor PERCY F. KENDALL, F.G.S., who, it may be remembered, delivered a lecture on "The Underground Waters of the Lower Calder" at the meeting of the Institution of Water Engineers at Wakefield in the summer of 1913, read a paper on "The Anthracite Problem," in the course of which he disagreed with several of the theories commonly held concerning this combustible, and advanced others of his own.

Professor Kendall said the problem of the origin of anthracite was still unsolved. The characteristic of this variety of coal was that it was almost destitute of gaseous constituents. It might consist of as much as 95 per cent. of carbon—hence its smokeless quality—and it had a reluctance to burn except in a strong draught. There was a complete series of combustible materials of the coal order, ranging from peat on the one hand, and passing by way of lignite or brown coal, bituminous coal, and hard steam coal to anthracite on the other. The early belief was that the anthracitic condition was due to a process of natural distillation such as takes place in a gas-retort, but at a lower temperature. Something of the sort had taken place in a very few instances, but in South Wales, which was the great repository of anthracite in Great Britain, no such explanation could be invoked unless the cause were the internal heat of the earth, in which case some support could be found for the theory in the fact that when a seam was traced from its outcrop to the deep in many cases it passed from house coal to steam coal, and from this to anthracite.

Another suggestion was that the disturbance of the rocks in regions where they were greatly folded had permitted the liberation of the gaseous constituents. Thus, in the great Pennsylvanian coalfield, where the seams are but little disturbed, the coal is of a bituminous character; but the same seams in the Appalachian region, where the rocks have been greatly contorted, become anthracitic. The author reviewed the theories, and rejected that of the influence of heated rock, because no such conditions were found in the Welsh coalfield. He likewise rejected the other theory, because in regions where very high disturbance had taken place the coal had retained its bituminous character, while in the other adjacent regions not so affected it became anthracitic.

A new light was thrown on the problem, said Professor Kendall, by the discovery that the ash diminished as the anthracite character became more pronounced. This was the exact reverse of what one would expect, because if one constituent were taken away the natural supposition was that the others should remain in a higher ratio. Basing their finding upon this fact, the Geological Survey had concluded that the anthracitic character was due to an original difference. His own contribution to the controversy was that the ash found in coal was (by far the greater part) not the original ash at all. This should show a great preponderance of potash; and coal ash rarely showed any—the main constituents being iron and lime, which were exceedingly rare constituents of existing plants. He therefore concluded that the diminution in the quantity of ash was due rather to the removal of the original mineral constituents, and the high ash of the other coal to the introduction of new ones. This he connected with the fact that anthracitic coal was unjointed, while all other coals were very freely and closely jointed.

"London's Future Electricity Supply" will be the subject of a debate to be opened by Mr. P. C. Batstone at the meeting of the Junior Institution of Engineers on the 29th inst.

THE CONCRETE FOUNDATIONS FOR VERTICAL RETORTS AT THE BIRKSHALL GAS-WORKS, BRADFORD.

By Ernest J. Sutcliffe, of Bradford.

[A Paper Read before the Yorkshire Junior Gas Association, Jan. 16.]

The site chosen for the position of the new house for the installation of a Woodall-Duckham vertical retort plant capable of producing 5 million cubic feet of gas per day is at the west end of the present retort-house, and, roughly speaking, at right angles with it. The departure from the usual procedure of building retort-houses either in parallel or in line was decided upon after very careful consideration of all the factors of the case—the railway communication and accommodation for both coal and coke, the handling of the coke made and convenience of storage for it, and future extensions of the system. From each of these standpoints the selected site was preferable to one parallel or in line with the present house. The outside dimensions of the new house are 187 feet long by 73 feet broad.

The original ground level of the site was, on an average, about 6 feet below the present yard level. In addition to this, the ground sloped from one end of the new house to the other about 6 ft. 6 in. from south to north, and in the direction across the house it sloped from east to west about 2 ft. 3 in. at the south end and 1 ft. 6 in. at the north end.

In preparing for the foundations, extra precautions were rendered necessary because of the fact that the whole area of the works had been honeycombed by coal workings which are only from 20 feet to 30 feet below the surface under the retort-house site, and at other parts of the works are not so deep as this. These workings had previously been examined and carefully filled up solid with stone backings, so that no danger of settlement on this account is now feared.

In order to ascertain the nature of the subsoil upon which the house was to be built, three shafts, each of about 5 feet in diameter, were sunk along the centre-line of the house. The information obtained was as follows:

Shaft A.

	Ft.	In.
Soil	1	0
Boulder clay	9	3
Yellow clay	4	0
Blue clay and sand	2	0
Ironstone		4
Clay and grey shale	1	0
Grey shale	5	0
Sandstone for at least	5	0
below		
	27	7

Shaft B.

	Ft.	In.
Soil		10
Boulder clay with wedge of sandstone in middle	15	0
Sandy shale	2	0
Hard shale	2	0
Soft shale (wedge shaped)	3	0
to		0
Very hard shale for at least	5	0
below		
	26	4

Shaft C.

	Ft.	In.
Soil		8
Boulder clay	12	6
Soft shale	2	4
Hard shale		4
Soft shale	1	10
Ironstone		7
Soft shale		5
Ironstone		4
Shale	1	6
Hard shale		6
Very hard shale	3	0
Coal	2	2
	26	2

(Hard shale below.)

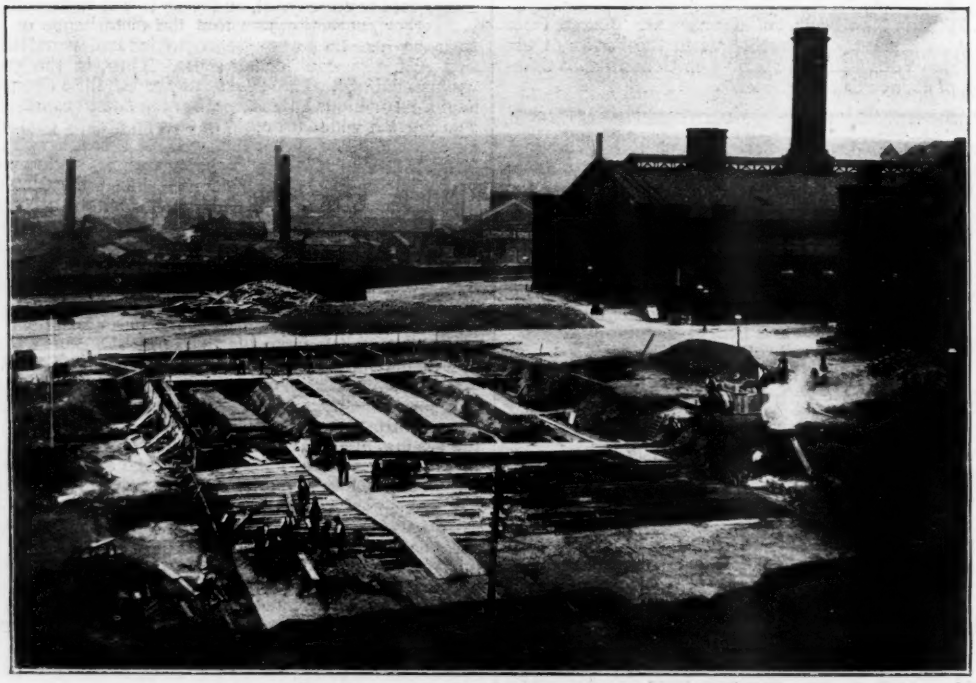
The clay immediately under the surface layer of the soil was very firm, hard, and compact, yielding very little on the application of pressure. It was therefore decided to take away the soil from the surface over the whole area; then, as the ground was on the slope in two directions, as before mentioned, make a series of horizontal steps or terraces of about 6 inches rise where necessary (so that the surface should be at right angles to the pressure upon it); and finally to put down a layer of concrete 18 inches thick over the whole area, upon which the piers for the retort-house wall stanchions as well as the bench stanchions should be erected.

The particular advantage of concrete for foundations lies in the fact that by its use in forming one large solid base or platform the weight of the superstructure is distributed over a large area—thus reducing the weight per square foot to whatever the soil is able to stand safely. The concrete itself must be composed of such materials as to be of sufficient strength and of such a thickness as to bear without crushing any possible weight or cross strain that may be placed upon it, and to settle bodily and uniformly in case of the subsoil yielding.

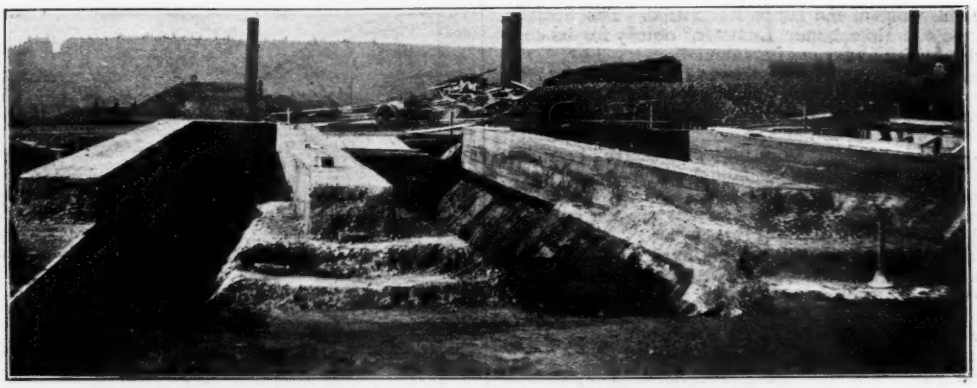
The trial shafts were first filled in with concrete—1 of cement to 10 of aggregate—to their full depth. After allowing sufficient time for this to set, the work of covering the whole area with 18 inches of concrete was proceeded with. This layer was of the proportion of 1 to 8 (1 of cement to 4 of coarse and 4 of fine aggregate). Before laying any concrete, the ground underneath was well pounded.

It was considered advisable to reinforce the concrete over about one-third of the area nearest to the south end, where the total depth of concrete was least. Steel railway metals and tram rails were used for this purpose, and were so embedded in concrete that we had about 3 square inches of metal per square foot. The steel was thoroughly cleaned, temporarily supported on bricks laid flat (which were removed as the concrete was filled in under the rails), and given a coating of neat cement grouting just previous to embedding them. Great care was taken to see that the concrete was well rammed in under the metals. The concrete which was used in this layer was 1 of cement to 6 of aggregate, and was laid in 9-inch layers. In no case was the depth of concrete below the stanchion bases less than 5 feet.

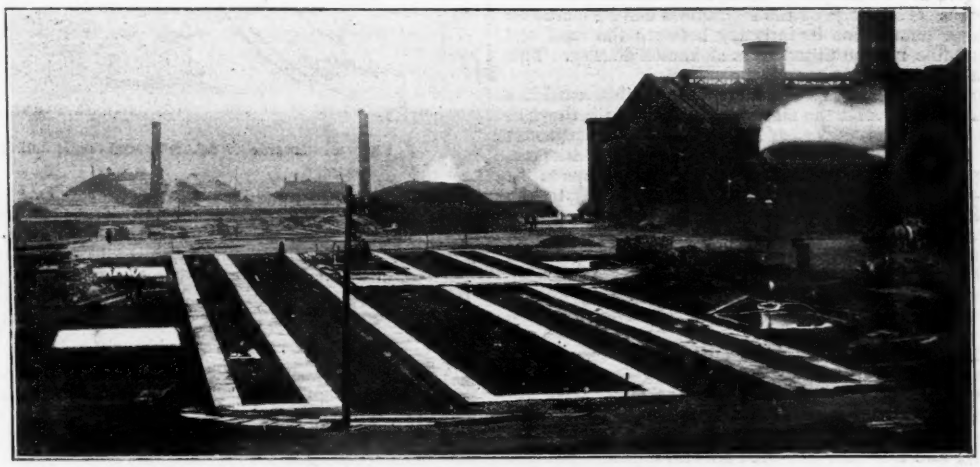
A word may here be added as to the advisability of reinforcing concrete. When subjected to compression, concrete offers great



SHOWING REINFORCEMENT LAID IN POSITION—AUG. 21, 1914.



SHOWING HOUSE WALL (ON LEFT) AND BENCH STANCHION PIERS—SEPT. 12, 1914.



SHOWING THE FOUNDATIONS READY FOR THE CONTRACTORS—OCT. 17, 1914.

resistance, and is very strong. It is, however, very weak in tension, so much so that its resistance to tensile stress may be, and usually is, neglected. Reinforcement, therefore, is adopted in order to supply the lacking tensile strength of the structure; and in reinforced concrete calculations the fundamental principle is that the concrete resists all compression and the reinforcement the tensile stress.

The piers for the retort-house walls were built of concrete with a batter of 1 in 12 on each side, equivalent to an increase in thickness of 1 in 6. These were carried up in layers of about 18 inches in depth at intervals of not less than two days. For these piers a mixture of 1 part of cement to 8 parts of aggregate was used. As is common knowledge, in the Woodall-Duckham vertical retort system the whole setting is erected upon built-up steel stanchions, and not upon brick piers as in the Glover-West system; hence the weight upon the bases of these stanchions is much greater per unit of area than when it is distributed by means of brick piers.

The bench stanchion piers were so constructed that the weight upon them was distributed over the whole of the concrete bed. This was considered advisable because of the heavy loads on the stanchions, which was shown by the foundation load plan to be 100 tons each on the outer ones and 91 tons on the inner ones, equivalent to a load per square foot of 12 tons 10 cwt. and 11 tons 10 cwt. respectively. The sides of the piers were roughly framed in timber at an angle of 45°—starting at a point 18 inches from the centre-line between the two piers—and carried up at this angle until the line struck the batter of 1 in 12. These piers were given the same batter as the house wall piers. From this point the piers were built up with the 1 in 12 batter of 1 to 8 mixture to within 18 inches of the finishing level, the last 18 inches being of 1 to 6 concrete.

Both the pier and wall foundations were temporarily finished off at 18 inches below the retort-house floor level. The stanchions will be erected upon them at this level, and afterwards a further 18 inches of concrete will be added; so that the bases of the stanchions will be embedded 18 inches in concrete. The spaces between the various piers were later on, after the concrete was well set, filled up with the clay, &c., which had been taken from the site—being well pounded after watering.

For mixing the concrete we purchased a mechanical mixer, which did its work in so satisfactory a manner that the saving in labour on the job alone more than paid for the machine. This, however, was not the only advantage gained by its use. The mixing was much more thoroughly done than could possibly be the case by hand; was much quicker in work (which was a great consideration to us); the consistency of the mixture could be easily and readily varied as and when required; and, most important of all where good work is required, the cement is uniformly distributed throughout the mass, which is therefore homogeneous and uniform in colour. Mixing by hand labour requires constant and continuous supervision at every mixing platform, and even then the consistency of the different mixings is anything but regular or homogeneous.

Great care was taken to keep all the aggregate, &c., free from clay and other foreign matter, and the aggregate was kept wet before measurement. In laying the concrete all vertical joints were avoided when leaving off temporarily; and in re-starting and putting down a new layer, all surfaces were well brushed and swilled with stiff brushes and an abundant supply of water, and, when thoroughly cleansed and freed from all the surface layer of clayey matter which comes on concrete during setting, was well grouted with a grout of neat cement. The concrete was filled in in a very wet—almost a semi-liquid—state, and well pounded or prodded with shovels, so that no air-spaces were possible. All concrete while setting was thoroughly wetted each day by a hose pipe, to prevent premature drying. The wooden frames were left in position at least two days after filling with concrete.

PHOTOMETRY OF INCANDESCENT LAMPS AND BURNERS.

By J. W. Roper, of Bradford.

[A Paper read before the Yorkshire Junior Gas Association, Jan. 16.]

On the introduction of high-pressure gas supply in Bradford, I had occasion to obtain tests of various high-pressure lamps, and particularly their illuminating value at certain angles. I also wished to carry out a series of tests on low-pressure burners with various globes and shades, and therefore set about to find a quick and accurate method for obtaining these results. As the existing apparatus solely comprised an ordinary 60-inch open-bar photometer in a very small room, it was necessary to make some new arrangements, and at as small an expense as possible. In the following notes I wish to try and explain the method adopted, and my reasons for the same.

The only room at my disposal was one 16 ft. long by 6 ft. 6 in. wide by 12 ft. high partitioned off from a store-room, the partition being on one of the long sides. Most of the arrangements advertised by the various makers require a large room, and are in addition very costly; so they were put on one side. The various portable photometers and illuminometers were then considered. A great advantage of these instruments is that they can be used

for checking the value of the lamps when fixed. The final decision fell upon the Holophane "Lumeter," chiefly for its compactness, light weight, and ease of manipulation.

The "Lumeter" consists of a small box 5⅜ in. by 4½ in. by 1¾ in. inside which is a circular whitened chamber. In this chamber is carried a small glow-lamp connected by flexible wires to an accumulator. The light from the lamp passes through an adjustable shutter on to one side of a small white disc, the centre of which is transparent; the disc being so arranged that by looking through the instrument one can see right through the centre of the disc. A matt-white celluloid card is now placed in any position on which it is required to find the illumination; then, by looking through the lumeter at the card, and gradually opening or closing the shutter in front of the glow-lamp, a balance can be obtained between the outer circle of the white disc and the centre—*i.e.*, the card seen through the centre. On a graduated scale on the instrument, in connection with the shutter, can then be read the foot-candle illumination upon the card.

If the candle power of a lamp is required, the card is placed at a known distance from the lamp at right angles to the rays of light, and the foot-candles multiplied by the distance in feet squared will give the candle power of the lamp under test at that particular angle. The range of the instrument can be increased for reading high illumination by inserting between the card and the disc a suitable neutral tinted glass of known density. This gives a range of from 0·01 to 2000 foot-candles.

The next point to decide was whether to fix the white card in a central position and revolve the lamp round it to obtain the illumination, at the various angles, or to keep the lamp stationary and revolve the card. The second method was finally adopted, chiefly owing to the difficulty of moving heavy lamps (some of the high-pressure lamps weighing between 30 and 40 lbs.) to the different positions.

The walls and roof of the room were painted with two coats of dead-black paint, and upon one of the long walls—the partition wall—a chart was marked out in thin matt-red lines, which show up very clearly on the black wall; the centre line being about 5 ft. 6 in. above ground level. Fig. 1 shows the semi-circle divided at each 10° and marked as north and south of horizontal. Between the two circular lines a number of other lines are shown; these being drawn at one inch on either side of the line denoting the various angles, the reason for which will be seen later.

At the centre of the semi-circle, a 1-inch hole was drilled in the partition (a 3 in. by 3 in. upright being fixed behind the partition at that point); and into this was fixed a brass bushing, 4 inches long, having a ½-inch hole and a 3-inch flange with screw holes, so that it could be screwed fast to the partition. A piece of steel bar was next turned down for about 4 inches to fit nicely into the bushing; a collar about 1½ inches wide by ¼-inch thick being left on, and in front of the collar a piece 1¼-inches turned down to ¼-inch and screwed. A piece of wood, 5 ft. 6 in. long by 2 inches wide by 1 inch thick, was next obtained. About 2 inches from one end a ¼-inch hole was drilled, and through this was passed the end of the steel spindle and fastened with a ¼-inch nut; the bar thus swinging easily on the spindle and clearing the wall by the thickness of the collar of the spindle. Taking the centre of the nut as centre, distances of 3·17 feet and 4·48 feet were then measured along the bar, these being the square root of 10 and 20 feet respectively. At an additional distance of 1 inch, small ceiling brackets were fixed to carry the rod [described later] which holds the disc in position.

A piece of ¼-inch round steel rod, 24 inches long, was screwed at

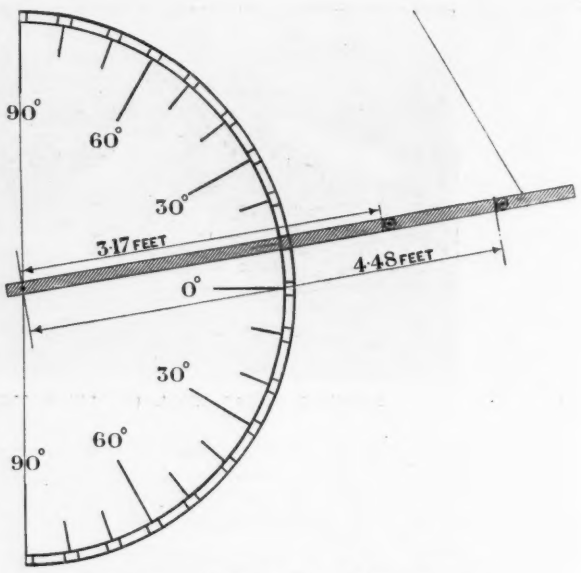


Fig. 1.—Movable Disc-Carrier and Angle-Indicator.

one end to fit the thread in the ceiling brackets. This rod could thus be screwed into either of the brackets on the movable bar. A piece of blackened tin, about 4 inches square, was then fixed to a piece of copper tube which would easily slip on the steel rod, while a small set-screw allowed it to be fixed in any position. The lumeter disc can then be strapped to this carrier by means of two rubber bands. This is shown on the plan, fig. 2.

To Operate the Movable Bar.

A small hook is screwed into the top of the bar near the end, and a cord passed up to the roof, over a double pulley, across the roof over another pulley, and down to a winch on the opposite wall (as shown in fig. 3). This completes the disc carrier, which can be set at any angle desired. The bar is 2 inches wide, and just fits between the lines drawn on each side of the angle mark, thus facilitating the setting of the bar exactly to the angle.

The lamp carrier was the next point to be decided. If a fixture was made, the lamp could not easily be got at for adjustment. The difference in the lengths of the various lamps was also a difficulty; the centre of the mantle having to be exactly opposite the centre of the movable bar for each test. An arrangement was devised by which the lamp and carrier were suspended from a wire rope carried, from a winch fixed at the side of the other one, up the wall and across the roof to a point 22 inches from the opposite wall, where it passes over a pulley (see fig. 3).

This distance allows for the largest reflector I have yet had to test, and the disc-carrier is set to exactly the same distance from the wall by means of the set-screw. On the end of the wire rope there is suspended horizontally a piece of flat iron bar, 2 feet long by 1 inch wide by ¼-inch thick, through the centre of which a ½-inch hole is drilled, and a ½-inch nipple (2 inches long) inserted

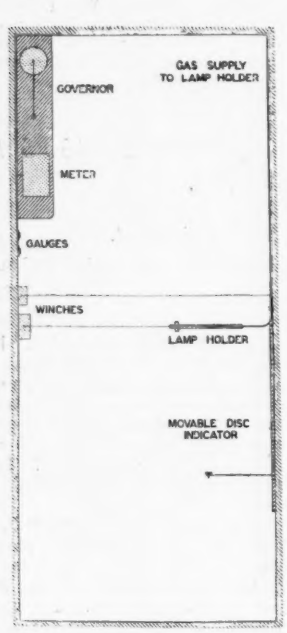


Fig. 2.—Plan.

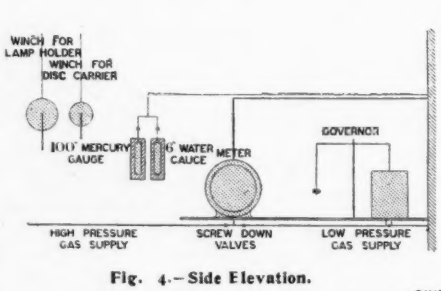


Fig. 4.—Side Elevation.

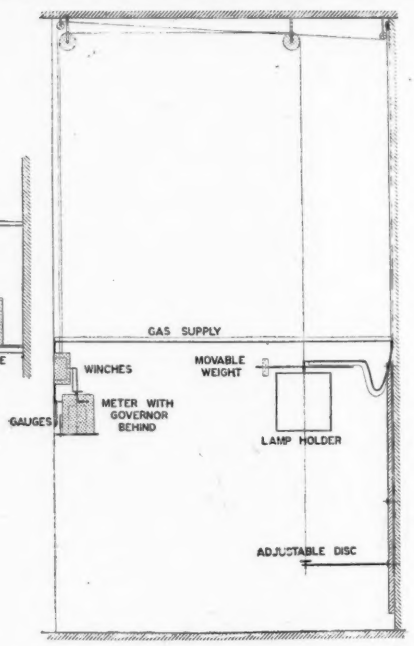


Fig. 3.—Front Elevation.

and fastened with a thin locknut on each side of the bar. On the top side of the bar is now connected a ½-inch elbow, then a tee-piece with two ½-inch and one ¼-inch outlets. One ½-inch connection is fastened to the elbow, and a 10-inch length of ½-inch pipe carried forward; and to this is connected a length of ½-inch flexible tube from the gas supply. To the small outlet of the tee-piece is connected a ¼-inch elbow and piece of pipe; and from this is run a length of ¼-inch flexible tube to a pipe which travels round the room to a couple of gauges—one water to 6 inches pressure, and one mercury to 100 inches of water pressure (see figs. 2 and 4). By this means the pressure is obtained as nearly as possible to the burner-head, and gives practically the pressure at the nipple. At the other end of the bar a small sliding weight is placed to counterbalance the weight of the two flexible tubes. Any inverted lamp or burner can now be connected to the under side of the bar by using a few reducing fittings. For upright burner testing, a small frame about 18 inches square was made from ¼-inch copper tube, with a ball-joint at the top and a vertical gas-feed at the centre of the bottom tube (see fig. 3).

On the opposite side of the room to the disc-carrier are fixed the two winches, two gauges, and the gas supplies (fig. 4). High-pressure gas feeds from the left and low-pressure from the right; screw-down valves being placed on each pipe. The low-pressure gas passes through a governor and regulating cock to the meter, the high-pressure gas feeds direct to the meter. From the meter outlet the gas travels round the end of the room and along the other side to the flexible feed connection. The return-pipe for the pressure-gauges passes round in the same way over the feed-pipe. The meter in use is an ordinary wet test meter, the front and back plates of the case having been strengthened. This works quite easily up to 100 inches of water pressure.

It will be noticed that the winches, gauges, and meter are all placed so that they can be read with the operator's back to the light under test. This is very important; for if one looks at the light—particularly so if an exceedingly powerful light is being tested—it is impossible to judge the illumination of the disc for several minutes. A light wood stand (which can easily be moved about), carrying a frame covered with a piece of black velvet, is used for protecting the eyes from any side light when making readings.

Method of Making a Test.

The lamp carrier is lowered, and the lamp or burner screwed on to the ¼-inch nipple under the iron bar; the joints being made tight by painting on the threads a thin layer of graphite compound, which does not burn fast with the heat. The lamp is now raised to a height at which the air and gas adjusters can easily be reached, the lamp lighted, and adjusted temporarily. After allowing it to burn for at least half-an-hour to get thoroughly hot, the lamp is again adjusted, and set to the required pressure, then hoisted to the correct position for testing—*i.e.*, with the centre of the mantle opposite the pivot of the movable arm. This is easily obtained by using a light wood set-square having one long side about 2 feet long and one short side about 1 foot. By placing the short side to the wall, the top level with the pivot, the long side will stretch right across the mantle, and the centre can easily be judged.

While the lamp is getting hot, the lumeter is checked by fixing the disc at a known distance from a 10-candle power standard burner and making several readings. This is necessary, owing to the accumulator varying; but any variation can easily be corrected by adjusting the position of the lamp in the instrument, for which provision is made.

The white disc is now fitted to the carrier and placed in position to receive the horizontal rays from the lamp; the disc being vertical. The movable screen is next placed between the lamp and the operator; and the lamp is left for a short period to enable the operator's eyes to rest after setting.

When ready for taking readings, the pressure is noted, the consumption of gas by the lamp taken at the meter, and the first reading at horizontal taken with the lumeter. The disc is then dropped to 10 degrees south by means of the winch, which can be done without looking at the light, and another reading taken. This is continued to 90 degrees south. After a few minutes' rest, the readings are taken again—this time working upwards from the bottom. By this means, very reliable tests can be obtained. The pressure and consumption are again noted, and if a large number of readings have been taken, the lumeter is again checked by the 10-candle power burner to make sure no alteration has occurred. From the results obtained, polar curves can readily be plotted-out, and the angle of maximum light from the lamp easily obtained at any time.

At the meeting of the Institution of Mechanical Engineers next Friday, Mr. John Dewrance will read a paper on the "Standardization of Pipe-Flanges and Flanged-Fittings."

For the forty-fifth annual meeting of the New England Association of Engineers, which will be held in Boston on the 18th and 19th of next month, five papers have been prepared—viz., "New Vertical Settings at Fall River," by Mr. C. W. Hunter, of Boston; "Concrete Piles for Holder Foundations," by Mr. F. E. Drake, of Lynn; "Mantle Maintenance," by Mr. J. P. Conroy, of New York; "Industrial Fuel Gas," by Mr. W. H. Bradley, of Springfield; and "B.Th.U. Determination," by Mr. Brewer, of Meriden.

DIESEL PLANT AT THE WHITTON (IPSWICH) PUMPING STATION.

By Charles W. S. Oldham, Borough Water Engineer.

[Extracts from a Paper read before the Institution of Water Engineers, Dec. 11.]

Prefacing his communication with an account of the position of the Corporation Water-Works prior to the construction of the Whitton pumping-station, the author quickly brought his hearers down to a year or two ago, when the maximum demand for water had so nearly reached the maximum quantity available that the Council were compelled to seek a further supply. The site selected was about 2½ miles north of the town, and a trial borehole was sunk. This was 24 inches in diameter, and was carried to a depth of 30 feet from the surface, being lined with steel tubes for a depth of 54 feet. The boring passed through about 12 ft. 6 in. of clay and the remainder in the chalk. The rest-level of the water was found to be 35 feet from the surface, and continuous pumping for fourteen days and nights yielded 900,000 gallons per 24 hours—the level of the water falling only 15 feet from its rest level when pumping this quantity, and quickly rising to its normal level on pumping ceasing. Parliamentary powers were obtained to construct the new works; the author being supported by Mr. William Matthews, M.Inst.C.E.

In view of the possibility that the old pumping-station, with its supply of 2 million gallons per day, might have to be abandoned on account of the water becoming brackish, it was decided to enlarge the boring to a well 10 feet diameter to a depth of 90 ft. 6 in. from the surface; and at a depth of 66 feet, where, on sinking the well, it was proved the greatest flow of water occurred, a 6 ft. by 4 ft. heading was driven for 100 feet—the yield being increased by this alone some 250,000 gallons per day. The total yield from the well, bore, and heading was found by pumping to be about 2,250,000 gallons per 24 hours. To provide for an ultimate supply of 3,000,000 gallons per day being obtained at this site, the pumping main was laid 18 inches diameter.

The Water Committee went fully into the question of motive power, and decided to adopt an engine, working with crude oil, on the Diesel principle, leaving the type of pump to the manufacturers, who were invited to tender for the kind of pump they might consider most suitable. The Council ultimately accepted a tender for an engine on the Diesel principle, coupled to a high-lift centrifugal pump. The tender was about 50 per cent. lower than any other received; and the guaranteed fuel consumption was also one of the lowest.

Description of Plant.

The engine is a high-speed Sulzer-Diesel of the four-stroke enclosed type, with forced lubrication. It has four cylinders and is run at 330 revolutions per minute, developing at this speed 140 B.H.P. It has one fuel pump for the four cyclinders; and speed regulation is effected by opening and closing the fuel suction-valve operated by the action of the governor. The air-pump is of the vertical three-stage type. The exhaust is led to two silencers placed outside the building, which are very efficient. The engine-shaft is connected with the vertical pump shaft by means of machine-cut double-helical "Citroën" gear, which gives a speed of about 900 revolutions per minute on the pump-shaft with the engine running at 330 revolutions. Flexible couplings of the rubber pin type are provided between the engine shaft and the gearing, and between the gearing and the pump-shaft to give the necessary flexibility. The pump-shaft and rising-main, together with the pump, are suspended from four girders at the top of the well; the girders being far enough apart to allow the rising-main and pump to pass between them. The vertical shaft which drives the pump is placed inside the rising-main and is about 80 feet long. In the author's opinion, it would not be advisable to work a pump with a vertical shaft exceeding 100 feet in length. The rising-main is 16 inches diameter, and is constructed in 8 feet lengths, the flanges of each section containing a bearing with renewable lignum-vitæ bushes forming guides for the pump-shaft. The shaft lengths are coupled together with rigid couplings and renewable gun-metal bushes. The top of the pump-shaft runs in a thrust-bearing of special design, and the weight of the shaft when working is taken partly by the pump and partly by this bearing. The suction-pipe is provided with a double flap foot-valve (which can be opened if necessary from the surface); it being important to keep the rising-main full of water in order to prevent the upper part of the shaft from rusting, due to being alternately wet and dry. A non-return valve is fixed on the pumping-main to prevent shock to the rising-main and foot-valve when stopping the plant. The lubrication of the gears and top thrust-bearing is an important feature of the design. The oil is contained in an oil-well at the bottom of the casing, and is pumped by a screw device upwards through the thrust-bearing, and on to the gear-wheels, whence it flows back to the oil-well, where it is cooled by water coils before being again pumped up.

The main pump is a high-lift vertical centrifugal three-stage one, capable of delivering 1850 gallons per minute against a head of 164 feet, and 1400 gallons per minute against a head of 216 feet, in both cases at a speed of 350 revolutions per minute of the engine-shaft. The fuel consumption guaranteed was 784 lbs. with a margin of 5 per cent.—that is, a maximum of 823 lbs. of fuel for

each million gallons pumped. Careful running trials showed that, owing to the water in the well not falling as low as anticipated by some 10 feet, the most economical speed at which to run the plant was about 330 revolutions per minute; and at this speed the results proved that one million gallons could be pumped against an average head of 203 feet with a fuel consumption of 655 lbs. Further tests proved the pump capable of supplying water at considerably greater heads without speeding-up the engine; the results being 1250 gallons per minute against 226 feet head, and 1080 gallons per minute against 236 feet head. It should be noted that on starting the plant, the sluice-valve on the delivery main is closed for a few minutes; the head on the pump being then 229 feet. The plant is run by one man, who is not a fitter, and who has had no previous experience of Diesel engines, the only other employee at the pumping-station being a youth engaged as cleaner and for general work in the grounds.

Owing to the fact that the plant was of such a novel type, the Corporation required very stringent guarantees from the makers. The engine and pump were guaranteed for two years; and the vertical shaft and gears for four years—the guarantee including a definite undertaking by the contractors to replace the gears, should they prove unsatisfactory or defective in any way during the period of guarantee, with some other form of gear. Should experience show the form of gear then installed to be unsatisfactory, the same guarantee was to apply to any alternative gear.

The water pumped is measured by a 12-inch Leeds Helix meter, with graphic recording apparatus, placed on the pumping-main; and very careful periodical measurements of the water pumped compared with check measurements at a reservoir prove the meter to be accurate and reliable. A water-level indicator with low-water alarm is fitted in the well, and has proved very satisfactory. It is of simple construction, has no floats or pulleys, but consists of a hollow tube suspended in the water with the bottom end sealed. The depth of submergence of this tube is indicated on a dial through rack-and-pinion gear.

From the time the plant was put to work in February last up to the middle of October, 150 million gallons had been pumped; and the average quantity of fuel used to pump one million gallons against a head of 203 feet has been 645 lbs. The average cost of crude oil being £3 13s. per ton delivered into storage tanks at the pumping-station, the fuel cost per 1000 gallons lifted 100 feet works out at 0·125d., or one-eighth of a penny. Including paraffin, which is used for a short period at each run, the total fuel cost averages 0·136d. per 1000 gallons lifted 100 feet.

The following are the costs of the various works carried out:—

Hire and purchase of land	£900	0	0
24-inch bore 301 feet deep, lined 54 feet, together with fourteen days' test pumping	649	0	0
10 feet diameter well 90 ft. 6 in. deep, cast-iron lined, 100 feet heading 6 ft. by 4 ft., and test pumping	2,429	0	0
3791 yards of 18-inch cast iron pumping-main, pipes, and laying, complete with valves, way-leave, &c.	5,749	0	0
12-inch Helix meter	150	0	0
Engine-house and foundations (allowing for second set), roads, fencing, &c.	2,361	0	0
Cottage	250	0	0
Engine, pump, and 10-ton crane	2,539	0	0
Oil cart, boiler for storage, &c.	155	0	0
Lighting plant, level indicator, telephone, &c.	110	0	0
Making good highways	272	0	0
Forming banks, clerk of works, &c.	340	0	0
Total	£15,895	0	0

NOTE—The cost of the Act of Parliament, which included powers other than for the Water Department, was £1620, repayable in five years.

The plant has, up to the present, worked exceedingly well, and no trouble has been experienced. The new works have relieved the Corporation from any anxiety as regards the possible contamination of the other supply, and have enabled them to supply water in bulk to various outside authorities, including His Majesty's naval training establishment and ships at Shotley, near Harwich.

DISCUSSION.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company), in the course of a few comments on the paper, said one could easily say and believe that this was an excellent installation; but, of course, the Corporation took the risk of a rise in the price of oil. He did not know there was anything else to be said against it. Coming to the question of economy, he was not sure whether or not the author considered he had got the cheapest installation in the country; but he had one about as cheap as any. He had not, however, got it on the point of fuel, because he said that the total fuel cost averaged 0·136d. per 1000 gallons lifted 100 feet. On actual working for twelve months, he (Mr. Hill) had pumped water at 0·072d. per 1000 gallons lifted 100 feet. This was nearly one-half the figure mentioned by Mr. Oldham. It would be interesting to know in two or three years' time just what had been the experience with the plant. Where the author gained was in the low capital costs. The principal costs on a pumping-station could be divided between working charges (fuel being one of the chief items) and interest on the capital. This was a case where they had low capital, and therefore the interest was low, and the fuel charges were comparatively high. It was a question of balancing the two to precisely ascertain the financial situation. What would be especially interesting would be to learn the results of the machinery, after a few years' running. He agreed that the Diesel engine had been greatly improved in the last few years.

Mr. F. W. DAVIES (Nottingham) said a great deal had been heard about these Diesel engines; but up to the present few water engineers had adopted them. He should be interested to know more about this plant when Mr. Oldham had had it running for some years. He noticed that only one engine was referred to; but provision had been made for a second well. He thought it was the usual practice to put down two engines—one being held in reserve. What provision had Mr. Oldham made in the event of the plant failing at any time? At Nottingham, they had an engine the cost of fuel for which worked out to 0·075d. per 1000 gallons lifted 100 feet, which was about the figure mentioned by Mr. Hill.

Mr. A. B. E. BLACKBURN (Sunderland) said it seemed to him that with a high-speed pump like this, there would be considerable wear and tear. He should also like to know whether the author had taken any records as to the quantity of slip of the pump, and what method had he for getting access to the bottom of the vertical shaft?

Mr. F. W. HODSON said that it seemed to him that the author had made considerable provision for wear in the gearing at the top. He asked whether it had been necessary to put in special cooling apparatus for the oil. They were told that lubrication was by pumping through the thrust-bearing, where it got into the casing containing the principal gear wheels; and it was there cooled by water-coils before being pumped up again. He remembered hearing of a case of gear of this nature, in which the oil got so extremely hot that one could not bear one's hand on the casing at all; and it seemed to him that there must be enormous wear on the gearing if the oil was kept at such a heat that one could not do this.

Mr. H. C. ADAMS said he had not been able to trace whether or not the efficiency of this plant came up to the guaranteed figures, though he understood the efficiency was on the safe side. The contractors appeared to have been invited to tender for the plant they thought most suitable; and apparently there was no limit put upon the capital cost of the plant for which the contractor could tender. They were also told that the guaranteed fuel consumption of the plant adopted was one of the lowest, and that with the more expensive plant one could not get much better efficiencies. Like Mr. Ashton Hill, he (Mr. Adams) thought this statement wanted qualifying a bit.

Mr. C. H. PRIESTLEY (Cardiff) inquired the nature of the ground in which the cast-iron pipe was laid. He noticed that it cost 31s. 4d. per yard, which was rather low.

Mr. DAVIES asked to be allowed to add to his previous remarks that, like most engineers, he preferred a slow-running engine; but these often entailed great expenditure for foundations. He had often thought that, if it was his good fortune to put down a pumping plant again, he should adopt a slow-running engine in conjunction with a fast-running one. Generally speaking, one engine was a reserve to the other. He suggested whether it would not often pay water authorities to study the question of having a fast-running engine as a reserve for emergency purposes. Although the economy might not be so great as with a slow-running engine, there would be economy in the lower initial costs.

Mr. HODSON put the further inquiry as to whether, with the pump slung by a chain in the well, there was not great vibration of the whole thing from the high speed.

Mr. OLDHAM, in reply, said he was not altogether in favour of putting in this plant. He himself got it placed upon the minutes that his opinion was that it was too much of an experimental thing for water supply. The Committee, however, said that if there was a saving on the contract by going in for this plant, they were justified in taking some risk to save the money. The machinery had given little trouble and excellent results. Mr. Hill had raised the question of fuel economy. Coal was rather dear in Ipswich; Bolsover coal cost him 21s. a ton. The pumping costs with Worthington triple-expansion engines cost him 34s. per million gallons with the same lift into the same reservoirs. This was against all costs (including lubricating oil, which was rather a large item, and fuel) with the Diesel engine of 25s. 7d. This was with crude oil, at £3 13s. per ton delivered. He hoped to get 10s. off his next purchase. There were also no stand-by losses, no stokers, and so on. There were, in fact, many things to be taken into consideration with the Diesel engine. On the point of efficiency, one would have to go a long way to beat it with coal costing 21s. per ton. As to the results in two or three years' time, he should have great pleasure in then making a further communication to the Institution. When the pump was actually running, it was balanced to a nicety. As to the cost of the main, it was made somewhat more expensive by being laid under the footpath and not in the road. As to putting in a second set, this would probably be done—in (say) two years' time—if this set went on all right. Mr. Blackburn asked a question as to wear and tear. So far as the gear was concerned, wonderful improvements had been made; and it ran as sweetly as possible. Regarding the slip, he had the 12-inch meter on the pumping-main read daily. It was checked; and he did not find there was any decrease whatever. On an average, the delivery was 1500 gallons per minute, at a speed of 330 revolutions. One extra revolution of the engine made all the difference. So far as slip went, there was no sign of it at present. In asking for tenders, there was no limit imposed as to capital cost. The Committee decided to have a Diesel engine to save stand-by losses and dear coals. Mr. Hill thought the statement in the paper as

to the tender required qualification. What was said was that the tender was 50 per cent. lower than any other received; and the guaranteed fuel consumption was also one of the lowest.

Mr. ASHTON HILL said then all he could say was that there was not a good set of tenders submitted. An engine could be obtained that would do the work at nearly half the fuel costs; and if this was worked out, it would probably be found that it would pay to spend another £10,000 of capital to save on the fuel costs. The statement certainly should not go forth that this plant was an economical one for fuel.

Mr. H. C. HEAD: We have been told the price of coal at Ipswich is 21s. a ton.

Mr. ASHTON HILL: That is true; it is double the usual price. Taking the plant as a whole, it is, at Ipswich, an economical one; but it should not go forth that it is an economical one in fuel consumption.

Mr. W. J. E. BINNIE observed that the Diesel engine was found to be economical at Biggleswade.

Mr. OLDHAM said the figures he had given in the paper were full ones. As to the type of pump, this was left to the parties tendering. More oil and power were required to drive a three-throw pump than a centrifugal one.

THE LATERAL PRESSURE AND RESISTANCE OF CLAY, AND THE SUPPORTING POWER OF CLAY FOUNDATIONS.

By ARTHUR LANGTRY BELL, B.A., B.E., M.Inst.C.E.

[Abstract of Paper Read at the Ordinary Meeting of the Institution of Civil Engineers, Jan. 12.]

The paper opened with a reference to the difficulty to be anticipated in attempting to estimate the lateral pressures and resistances of clay; its constitution and properties being obscure. It was pointed out that the engineer is not interested in the complex problems which attract the attention of the physicist, but would be content with a practical, simple, and sufficiently correct method of estimating the pressures and resistances exerted by clay, so far as these affect the design and stability of structures.

Published information is unfortunately insufficient to aid an engineer when confronted in practice with problems calling for a precise knowledge of the matter. He cannot hope to build a safe structure at the least cost unless he can make some reasonably accurate estimate of the forces with which he has to deal. Owing to reasons which appeared later in the paper, the accepted theories of earth-pressure do not afford him much assistance.

There are two theories of earth-pressure ordinarily used in English practice—Coulomb's and Rankine's. Both theories apply to a "loose granular mass"—a definition which cannot possibly include undisturbed clay. Both also presuppose a knowledge of the angle of repose. The text-books in current use give angles of repose for clay varying from 1° to 45°; and observation of the material itself is of little value when selecting the angle to be used for calculations. Widely different results will be obtained according to the angles chosen. The results of calculations by these methods are also found to be at variance with observed facts.

In the author's view, the lack of agreement is due not so much to error in the existing theories as to a misapprehension as to the extent of their applicability. It was the purpose of his paper to bring before the members of the Institution an extension or modification of Rankine's theory which, when applied to clay, yields results more closely in accordance with fact and observation.

A short description was then given of the monolith foundation work at Rosyth Dockyard, as it was in connection with this work that the investigation which forms the subject of the paper was made. As the work of founding the monoliths proceeded, Rankine's formulæ were duly applied to the different cases which arose; but in view of the doubt as to the applicability of the formulæ to clay, and as to the correctness of the assumed angles of repose, the results were regarded rather as aids to practical judgment than as actual and reliable solutions of the problem of stability.

A search through all available records did not yield much information of value or furnish a theory of clay pressure. Practical experience with tunnels and embankments appeared to indicate that the pressures exerted by clay resembled those due to a heavy fluid. This view was supported by a quotation made from a previous contribution by the late Sir George H. Darwin, whose search revealed a high percentage of failures in work constructed in clay.

The broad conclusions to which the investigation led were that there was no available theory of earth-pressure which, when applied to clay, would command the general confidence of engineers. There were no fixed rules of practice; and there were grave differences of opinion as to what intensities of pressure could safely be placed upon clay foundations.

Experiments were undertaken with a view to throwing further light upon the question. The first experiments described were made in a small testing cylinder, 8 inches in diameter, fitted with gauges at the ends and sides. The results were given of a few tests with this apparatus; but the author did not regard them as having much value.

Up to this point (following established custom) it had been thought that, however difficult it might be to find the true angle of repose for clay, it might be possible by experiment, or as the result of experience, to hit upon an angle which, when introduced into the generally recognized formulæ, would give correct results. Suspicions were now felt that the root of the difficulty lay deeper; and that the true reason why Rankine's and Coulomb's theories were not applicable to clay was because clay did not conform to the law of resistance to shear which forms the initial basis of both theories.

Rankine expresses the primary law upon which his theory is based in the following words: "The resistance to displacement by sliding along a given plane in a loose granular mass is equal to the normal pressure exerted between the parts of the mass on either side of the plane multiplied by a specific constant."

The symbolical expression of this law is

$$q = p_n \mu = p_n \tan \phi.$$

p_n representing the intensity of normal pressure on the plane of shear, and q the intensity of resistance to shear on the same plane. The "specific constant" μ is equal to tan ϕ; ϕ being the angle of repose.

If it could be shown that clay failed to comply with this primary condition, then it seemed clear that formulæ deduced from this condition were inapplicable to clay.

To carry out the desired tests another apparatus was made, consisting essentially of a vertical cylinder, 3 inches diameter and about 10 inches high. Fitting into the upper end was a plunger which could be weighted on top, so as to compress the clay placed within the cylinder below it. Arrangements were made whereby the clay (while under pressure in a vertical direction) could be sheared through horizontally. The vertical load upon the clay and the pull required to shear through the clay being both known and capable of variation at will, it was possible with this apparatus, by making successive tests with different specimens of the same clay placed under varying degrees of compressive stress, to determine the law which governs the relation between the ultimate shearing resistances and the normal pressures on the planes of shear.

Experiments made with sand gave results closely in accordance with Rankine's law, as stated above. It was found that no kind of clay complied with this law. According to Rankine's law, where there is no pressure there is no resistance to shear; but in all cases clay was found to resist shear where the pressure was zero. The rate of increase of shearing resistance with advancing pressure was found not to be so great as would be inferred from Rankine's law, adopting the angles of repose ordinarily current in practice.

It was found that, when plotted in diagram form (with equal horizontal and vertical scales), the results with clay could be represented, with reasonable accuracy, by straight lines. These lines did not, however, pass through the origin (as would be the case in material complying with Rankine's law). In all cases they cut the vertical axis which passes through the origin at a distance k from the origin; and with advancing pressure the resistance to shear increased in proportion to an angle α—the inclination of the straight line to the horizontal axis.

Stated symbolically, the law to which clay conformed—so far as its shearing properties were concerned—was found to be

$$q = k + p_n \tan \alpha$$

q representing the intensity of resistance to shear; p_n the intensity of normal pressure upon the plane of shear; and k, the intensity of resistance to shear under zero pressure. The law stated above becomes identical with Rankine's, if k be taken as zero and α as the angle of repose.

To make clear the state of stress and of resistance within a body subjected to external pressure, curves were shown illustrating the intensities of stress and resistance in sand and in clay. From these diagrams, and by a simple mathematical proof, it was shown where the plane of rupture occurs both in sand and in clay. The position of the plane of rupture ascertained in this manner is found (in the case of sand) to be identical with that deduced in a different way by Coulomb.

Having determined the position of the plane of rupture in clay, the author next proceeded, by considering the equilibrium of minute masses of clay in contact with the wall, to deduce formulæ for the pressure and resistance of clay. The deduced formulæ are compared with Rankine's in the table on next page. These formulæ suffice for the design of retaining-walls in clay; the surfaces being assumed horizontal. The paper was limited to the consideration of this case only.

If k be taken as zero and α equal to ϕ, the new formulæ (with one exception) become identical with Rankine's. The exception referred to—namely, the minimum permissible intensity upon a foundation—was then discussed, and reasons were given for adopting the newer formula. It was also pointed out that there is another essentially practical reason for the final abandonment of the value wH—namely, that, by what appears to be the general consent of engineers, it has, in fact, been already abandoned. It is questionable whether any large retaining-wall has been built in accordance with it.

It was thought desirable to supplement the theoretical work by making direct observations of pressure within a large mass of clay. The four diaphragm gauges used in the previous cylinder tests were built into the side of one of the monoliths—being

	Rankine.	The Author.
p_1 = intensity of active pressure on back of wall at any depth h	$w h \left(\frac{1-\sin\phi}{1+\sin\phi}\right)$	$w h \tan^2\left(\frac{\pi}{4}-\frac{\alpha}{2}\right) - 2k\tan\left(\frac{\pi}{4}-\frac{\alpha}{2}\right)$
r_1 = maximum intensity of horizontal resistance of material in front of a wall at any depth d	$w d \left(\frac{1+\sin\phi}{1-\sin\phi}\right)$	$w d \tan^2\left(\frac{\pi}{4}+\frac{\alpha}{2}\right) + 2k\tan\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)$
p_2 = minimum permissible intensity of downward pressure on foundation at heel of wall (depth H)	w H	w H $\tan^4\left(\frac{\pi}{4}-\frac{\alpha}{2}\right) - 2k\tan^3\left(\frac{\pi}{4}-\frac{\alpha}{2}\right) - 2k\tan\left(\frac{\pi}{4}-\frac{\alpha}{2}\right)$
r_2 = maximum permissible intensity of downward pressure on foundation at toe of wall (depth D) .	w D $\left(\frac{1+\sin\phi}{1-\sin\phi}\right)^2$	w D $\tan^4\left(\frac{\pi}{4}+\frac{\alpha}{2}\right) + 2k\tan^3\left(\frac{\pi}{4}+\frac{\alpha}{2}\right) + 2k\tan\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)$

arranged in two pairs. The gauges of the lower pair were fixed side by side at a height of 10 feet above the cutting edge of the monolith shoe; while directly above them, and 12 ft. 8 in. higher up, were the two remaining gauges. By adopting this arrangement, it was intended that each gauge-reading should constitute a check upon the reading of that beside it; while the readings of the lower pair at any depth would be checked at a later date by those of the upper pair when the latter reached the same point.

The actual uncorrected readings of all four gauges, taken from time to time as opportunities offered during sinking, were shown by diagrams, together with a section of the strata through which the monolith was sunk.

Unfortunately one pair of gauges was spoiled by leakage and, owing to damage by blasting, the records obtained from the other pair were insufficient to completely confirm the theoretical conclusions previously obtained. But so far as the records went, they appeared to be in reasonable conformity with the theoretical position discussed in the paper.

The laying of too much stress upon the few readings obtained is deprecated, and the practicability of making effective use of the new formu'æ was discussed. It was pointed out that it is not easy when designs are in progress to obtain clay in its virgin state, and from considerable depths below the surface, for the purpose of making tests; and in certain methods of construction—the sinking of monoliths, for example—the strata are often never seen in their normal condition, even when the works are in progress. Further, the building of a new work may have, in the course of years, the effect of altering the condition of the strata which press upon the structure. What the extent of these changes will be, and whether they will be beneficial to stability or otherwise, will never be determinable by purely mathematical methods. If reasonably correct results are to be obtained, some measure of judgment must lend its aid towards the solution of the real problems of earth-pressure which occur in practice, as distinguished from the simplified and somewhat unreal problems with which theorists necessarily deal.

The paper concluded with a tabular statement of the average values of k and α, so far as present experience goes; and in the appendices were included an independent proof by Professor Maurice F. Fitzgerald yielding results identical with those obtained by the author by different methods.

Nottingham Gas Reserves and the Trent Navigation Scheme.

The Nottingham Corporation had no difficulty in obtaining the assent of ratepayers, at a statutory meeting held yesterday (Monday) week, to the promotion of a Bill for improving the navigation of the River Trent between Nottingham and Newark, at an estimated cost of £160,000, and incidentally pledging the reserve funds of the gas undertaking and of other municipal trading concerns in support of the scheme. Nothing was heard in answer to the warnings which had been uttered at a previous Council meeting as to trenching upon the gas reserves, the building-up of which has been the result of years of quiet prudence. Other possible resources of the municipal exchequer, as represented by the funds of the tramways, electricity, and water undertakings, had also been included in the assets to be relied upon; but during the debates in the Council little had been heard of the last three in comparison with the gas savings, upon which it was made obvious the main call, in the event of emergency, would have to be made. Alderman A. Ball (the Chairman of the Gas Committee), while supporting any scheme for the development of the navigation of the Trent which was calculated to be in the interests of the city, had been content to call attention at the meeting of the Council to the objections to the financial provisions of the Bill, so far as they affected gas finance; and he did not attend the ratepayers' gathering, at which there were only five dissentients to the resolution empowering the Corporation to proceed.

On Saturday, the 2nd inst., at Glasgow, a serious short-circuit occurred on one of the main feeders from the Port Dundas electric station; and there was in consequence a partial interruption of the supply for about a quarter of-an-hour.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coke for Steam Raising.

SIR,—Though for the present coke sales have been so promoted by war needs that there is no longer any plethora, we shall have in the future to keep our eyes on likely uses; so I write to ask if it will be possible for you to print in a collected form the very able and cunning articles of a "Gas Engineer," on the promotion of use of coke in industrial works—chiefly for steam-raising. These articles were so practical, and seemed to be founded on a successful campaign, that they must not only be very useful to the London Coke Committee, but to every gas manager in the kingdom.

The authorship is quite unknown to me; but I rather suspect an able and enterprising young engineer serving a London Gas Company. At any rate, I could pledge companies which I direct to purchase copies of the articles as collected in quantities adequate to the cost and profit on issue. Can something be done?

Your issue of the 5th inst. contained two reports which specially appealed to me. The first was the report of a meeting of the National Steam-Car Company, when Mr. Clarkson dwelt on the success of coke as a steam-raiser in his omnibuses and in vans (of which the South Metropolitan and the Wandsworth Gas Companies are running a number). The experiments leading to this success arose out of a suggestion made by myself to Mr. Clarkson when he read a useful paper, on "Steam Omnibuses Heated by Petroleum," at the Institution of Civil Engineers; and so readily did he bite at it that at the *conversazione* some weeks later, he actually showed a breeze-burning furnace, and now has a perfected furnace for graded coke.

Having had a hand in Mr. Carr's converted furnaces for coke on sea-going steamers of large tonnage, and also in his converting his Company's steam-road waggons from steam coal to coke, you may believe these far-reaching developments have great interest for me.

As to tar and other residuals, your most interesting reprint of the "Romance of Coal Tar" from the "Manchester Guardian" recalls an occasion when, at a meeting of the Commercial Gas Company, I was led into a speech on that "fascinating domain," which drew down on me the animadversions of two authorities of weight on tar-burning in retort-furnaces at the time when tar was selling at under 1d. a gallon—to wit, my ancient friends Sir George Livesey and Mr. George Anderson, who considered my objections to destroying too ruthlessly the parent of such a wide and valuable a family as being "unbusinesslike,"

Well, we never know! "Time avenges"!!

HY. E. JONES.

Palace Chambers, Westminster, S.W., Jan. 16, 1915.

[Our correspondent's suggestion about reprinting the articles on the use of coke in industrial works shall certainly be adopted, as soon as the writer of them is able to compile the second appendix to them The first appendix, it will be remembered, appeared in our issue of Dec. 22, p. 659.—ED. J.G.L.]

The Extending Usefulness of the Gas Companies' Protection Association.

SIR,—At the request of Mr. H. E. Jones, the Chairman of this Association, I enclose a copy of a circular-letter which he has recently addressed to gas companies.

If you could see your way to insert the circular in your columns, it would be much appreciated.

F. W. COOPER, Secretary,
Gas Companies' Protection Association.

5, *Victoria Street, S.W., Jan. 15, 1915.*

[ENCLOSURE.]

GAS COMPANIES' PROTECTION ASSOCIATION.

5, Victoria Street, S.W., Jan. 1, 1915.

To the Chairman of the Board of the Gas Company.

Sir,—I have to call your attention to the important services rendered by this Association to the gas industry at large, as set forth in the enclosed report of the proceedings at the last annual general meeting,* and to point out that, in order to bring into the Association the numerous smaller companies, not at present members, the minimum scale of subscription has been reduced.

Since the meeting which dealt with the important matters included in the report, a very valuable decision has been given, on appeal, in favour of the gas companies, and chiefly by the assistance of this Association, in the matter of the action of the Attorney-General at the relation of the "Long Eaton Gas Company *v.* Long Eaton Urban District Council." This has secured a valuable precedent in the Court of Appeal, which must have the effect of suppressing most of the unfair steps taken in competition by municipalities supplying electricity to damage the interests of the local gas undertakers.

Moreover, the recent services of the Association to the gas industry—such as (1) securing the removal of sulphur restrictions in purification; (2) the adoption of better and more practical standards of illuminating value; and (3) the important modification of the limitations as to dealing with residual products, which interested parties among outside manufacturers had induced some Parliamentary Committees to place upon gas undertakings—prove incontestably the great benefit the Association has obtained for the industry at large.

Beyond these important services, the Association frequently advises the members on the numerous legal questions constantly arising in the course of a gas company's procedure.

You will see from the report that our President, Sir Fortescue Flannery, Bart., M.P., made some weighty observations on the necessity for

* This was a reprint of the "JOURNAL" report. See Oct. 27 last, p. 197.—ED. J.G.L.

more cohesion and strength amongst the companies in approaching parliamentary questions, owing to the diffiulties and sometimes prejudice encountered.

As it is of the greatest moment that the Association should be fully representative of the whole industry, and be able to speak with full weight on its behalf, it is desirable that every company, whether statutory or not, should avail itself of the services of the Association, and strengthen its ranks. Moreover, by increasing the number of subscribers, better monetary support can be realized than has hitherto existed; and the Association will be able to depend less than it has done in the past upon the generosity of a certain limited number of large companies who have liberally helped to fight the battles which have been necessary for the protection of the entire industry.

Under these circumstances I appeal to you to induce your company to join this Association, and to co-operate with it in a full and loyal spirit.

(Signed) Hy. E. Jones, Chairman.

Attack on Coke-Oven Bricks by Salty Coals.

Sir,—I am interested to see the letter from Mr. W. Colquhoun in your issue of the 12th inst.

I take exception to his statement that the deposition of carbon in the pores of fire-bricks "certainly does not bear on the subject originally introduced." Professor Simmersbach puts forward the remarks that I quoted in your issue of Dec. 8 as a possible cause of disintegration (or corrosion). As this was the subject in question, and also as I consider any opinion expressed by Professor Simmersbach to be worthy of consideration, I think Mr. Colquhoun's charge is a little wide of the mark.

I must respectfully disagree with Mr. Colquhoun that "the resistance to salt increases directly with the alumina contents." In my experience, this is not the case. Mr. Chaney, of Birmingham, also finds that silica bricks stood better. I venture to think, therefore, that the evidence is against Mr. Colquhoun. Perhaps my own statement in the first instance was a little too sweeping, and I should have added that, "as far as my experience goes, silica bricks stand corrosion best."

I welcome Mr. Colquhoun's suggestion that the discussion be revived; and I would like to see further expressions of opinion from gentlemen who have experienced corrosion in practice—not laboratory theorists, as I am afraid that "theory" and "practice" are a little at loggerheads in this case.

Jan. 13, 1915. The Writer of "Event and Comment."

Bombs in Continental Coal Deliveries.

Sir,—My attention has been drawn to a paragraph in your esteemed "Journal," No. 2694, p. 722, Dec. 22. You reproduce a note by the Geneva correspondent of the Paris "Temps," in which was stated that, through a warning circular issued by the "Swiss Gas-Works Union," in five different places in Switzerland finds have been made of live cannon shells; and that in a single consignment no fewer than eight shells were discovered.

A similar statement appeared in No. 164 of the "Neue Zurcher Zeitung;" but this and your notice are in one part erroneous. I have sent a warning circular to all Swiss Gas-Works; but it is not true that in any Swiss gas-works any shells, exploded or non-exploded, have been found.

You would oblige me by correcting your statement.

Kohlenvereinigung Schweizerischer Gaswerke.
per C. Roth.

Zurich, Switzerland, Jan. 8, 1915.

London County Council Electricity Scheme.

Sir,—I notice under "Electricity Supply Memoranda" you give some criticisms of the new electricity scheme. I think there is one point to which the attention of gas shareholders might be drawn, and that is to the serious principle which is involved—directly hostile to their interests.

The new electrical authority which the London County Council are creating is to have the power of raising capital on the security of the rates, and also to have the right of making up any shortcomings in revenue out of the rates. There will, therefore, be not only competition between municipal capital and the capital obtained in the ordinary way by gas companies, but also rate-aided competition. There is no saying to what extent this might not be carried.

Shareholders in gas companies—those resident in London—will thus, as ratepayers, have to put their hands in their pockets to subscribe money (to an indefinite extent) to provide funds for this authority to demolish their own profits by unfair competition.

It does not appear that the position is fully realized; and proper representations should certainly be made by all gas shareholders to their representative member of the London County Council.

There is a possibility, say at the meeting on Jan. 26, or the next meeting, that the promotion of the Bill may be defeated in Council on the fund question. This is the time when fair-minded members of the London County Council should take their stand against this wholly indefensible measure.

Jan. 13, 1915. Interested.

Cleckheaton and Gas Profits.—It has been decided by the Cleckheaton Urban District Council to inform the West Riding Education Committee that they cannot undertake to meet the deficit on the working of the town's secondary school in the financial year 1915-16, on account of a large prospective decrease in gas profits, out of which the school has hitherto been supported. New gas-works have, it was pointed out, just been completed at a cost of about £40,000; so that the capital charges will be much heavier than hitherto, and, on the other hand, a largely decreased profit is expected, owing to the effects of the war.

REGISTER OF PATENTS.

Vertical Retort-Discharger.

Waddell, A., of Dunfermline.

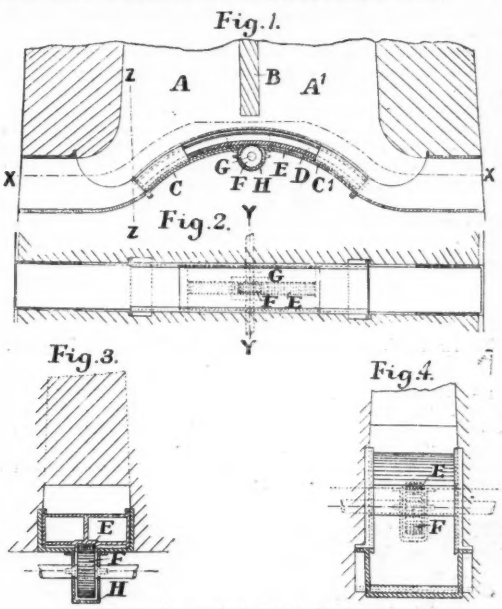
No. 6112; March 10, 1914.

This invention relates to means for effecting the discharge of coke from vertical gas-retorts in approximately uniform quantities, "with reduced liability to disintegration of the coke."

When arranged as two contiguous retorts separated by a partition, the retorts are provided with "convexly curved" floors; "the floors of the two retorts constituting a continuous arch and being disposed symmetrically in relation to the partition, which does not quite extend down to the floors." The summit of the arch thus represents the highest part of each floor; the chord of any arc lying on the surface of either floor being downwardly inclined. The curvature of the floors is said to be such that the inclination is almost sufficient to permit the coke to slide freely down each floor under the action of gravity. Fitted to travel closely above the floors are pushers, or, preferably, a single pusher common to the two retorts—the pusher being of "arcuate" form and concentric with the floors. The underside of the pusher is formed with rack-teeth with which meshes a toothed wheel on a rock-shaft in a lubricant-containing casing beneath the floors, in vertical alignment with the partition. When the shaft is rocked, the toothed wheel, engaging the rack-teeth, causes the pusher to be oscillated so as to propel in front of it to either side material resting on the floors.

The dimensions of the pusher and the length of its stroke are such that when the pusher is projected into one retort the entire surface of the floor of the other retort is exposed, so that the coke falls thereon and is propelled along it on the reverse movement of the pusher.

It is an important characteristic, the patentee points out, that the path of the pusher as a whole is substantially equidistant from the floor—*i.e.*, where the surface of the floor is an inclined plane the path of the pusher is also inclined and parallel to the plane; and where the surface of the floor is convexly curved the path of the pusher is an arc whose centre is substantially coincident with the centre of curvature of the floor. In this respect, the present invention is said to differentiate from prior constructions of retorts provided with inclined or curved floors over which the coke is moved by propelling devices.



Waddell's Vertical Retort Discharger.

Fig. 1 is a vertical section showing the lower end of a pair of contiguous retorts separated by a vertical partition. Fig. 2 is a sectional plan on the line X of fig. 1. Fig. 3 is a section on the line Y. Fig. 4 is a section on the line Z.

A A^1 are retorts separated by the partition B and provided with convexly curved floors C C^1 constituting a continuous arch and disposed symmetrically in relation to the partition B, which does not quite extend down to the floors. The summit of the arch represents the highest part of each floor; "the chord of any arc lying on the surface of either floor being downwardly inclined." Fitted to travel closely above the floors is the pusher D, already referred to. The underside of the pusher is formed with rack teeth E, with which meshes a toothed wheel F on a rock shaft G in a lubricant-containing casing H beneath the floors in vertical alignment with the partition B. When the shaft G is rocked, the toothed wheel F, engaging the rack-teeth, causes the pusher D to be oscillated so as to propel in front of it to either side material resting on the floors.

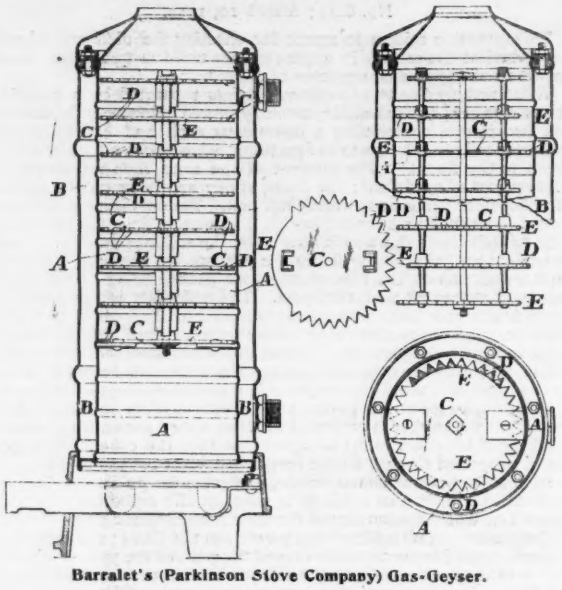
Water Heaters or Geysers.

Barralet, T. E., and the Parkinson Stove Company, Limited, of Birmingham.

No. 2633; Feb. 2, 1914.

This invention relates to the series of superimposed baffle-plates around which the hot gases are compelled to pass—each plate being made with a toothed or notched edge or periphery with a wide opening

or gap around a portion of one side. The plates are superimposed one above the other, so that the wide openings or gaps in adjacent plates come at opposite sides; the hot gases passing through the openings and through the gaps in the periphery of the plates, and being thereby caused to come into contact with the walls of the water-chamber and "quickly and effectively heat the same."



Barralet's (Parkinson Stove Company) Gas-Geyser.

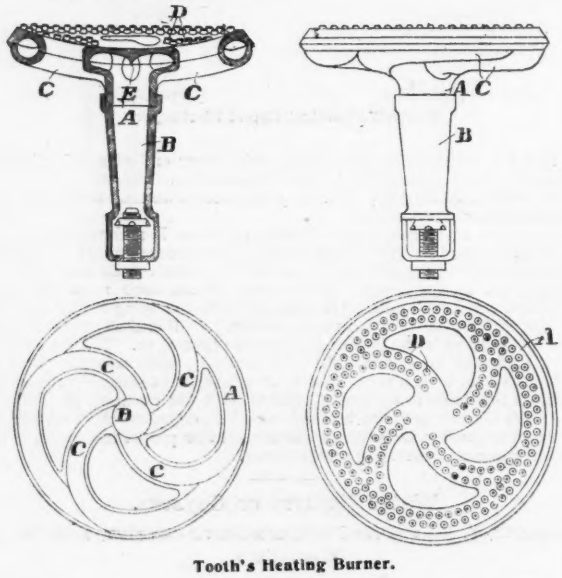
The geyser comprises a central flue A surrounded by an annular cylindrical water-chamber B. Within the flue (above the source of heat), threaded upon a central rod, are a number of vertically separated circular metal baffle-plates C, of approximately the same diameter as the flue, so that their edges come against the inner walls of the chamber C. The periphery of each plate is formed with gaps or notches D, and is cut away or gapped at E partly around the edge of the plate. The plates (superimposed within the flue one above the other) are separated from each other by distance-pieces; their lower ends being arranged to fit within sockets on the upper face of the next lower plate. The plates are so arranged that the cut-away part E of each alternate plate comes upon opposite sides. Thus, the hot gases arising from the source of heat come in contact with the underside of the baffle-plates and pass through the part E, and also through the small gaps or recesses D. The gases thereby come into contact with the inner walls of the chamber B, and "so quickly and effectively heat same."

Gas-Burners.

TOOTH, L. F., of the Commercial Gas Company, Stepney.

No. 2640; Feb. 2, 1914.

This is a modification of the ring-burner described in patent No. 13,583 of 1913, "characterized by a number of symmetrically disposed inlet tubes which enter the ring tangentially." The object of the present invention is "to devise a form of burner having these characteristics and in which the various inlets are all connected to a central tube, which may form the bunsen tube."



Tooth's Heating Burner.

The burner-head comprises a perforated ring (of the usual type) connected to a central tubular portion A by a number of tubular arms C, so curved as to enter the ring tangentially—all being curved in the same direction. The portion A is adapted to fit into the bunsen tube B, which is vertically arranged. The arms branch out more or less horizontally; and, if desired, they may also be perforated, in which case the perforations D are preferably inclined forwardly—*i.e.*, in the direction of travel of the gaseous mixture.

To ensure the equal distribution of the gaseous mixture along the various arms, the upper central part of the tubular portion A is formed with a depending conical projection E, which deflects the mixture along the arms.

The arms are made deeper towards the central tubular portion, so that they taper towards the ring and gradually merge into it in such a manner that the streams of gaseous mixture from the various arms do not interfere.

The burner is conveniently built up in parts—a top part comprising the upper part of the arms and ring, and a bottom part comprising the central supply or bunsen tube and the lower part of the arms and ring.

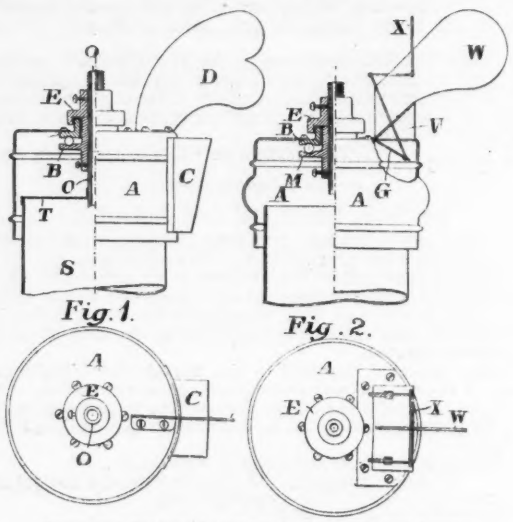
The burner has any number of arms, depending upon the size of the burner; thus small or medium burners are constructed with four arms (as shown), while larger ones are constructed with six.

Casings for Outdoor Lamps.

BOYER, J. F., of Bournemouth, and PODMORE, A. E., of Herne Hill, S.E.

No. 4850; Feb. 25, 1914.

This invention relates to lamp or lantern cowls or hoods, provided with a lateral aperture and a vane "adapted to freely rotate on a vertical pivot, so that, under the influence of the wind, the outlet in the drum for the escape of the fumes or products of combustion is turned in the direction towards which the wind is blowing, and the wind itself assists the escape of the products of combustion from the lamp."



Boyer and Podmore's Outlet Ducts for Street Lamps.

The illustration shows in part sectional side elevation and plan two forms of cowl constructed according to the invention.

In fig. 1 the hood A is attached to an upper ball-race B; the balls resting and being adapted to run in a lower ball-race M, provided with a sleeve screw-threaded internally and adapted to be fixed to the inlet gas-pipe O by a set-screw or other suitable means. The cap or shield E is provided with an internally screw-threaded sleeve fixed over the sleeve of the ball-race, and helping to protect it from the weather. The cowl is consequently free to rotate around the top of the upper portion or dome S of the lamp, and ingress of insects is prevented by providing a lid T, of wire-gauze (or having perforations), on top of the dome.

The flue C is a rectangular box or duct fixed over a hole cut in the side of the drum, and serving to create a draught which helps to draw off the fumes from the lamp. The tail or wing D is fixed on the roof of the drum over the fume-outlet C, and keeps the outlet turned away from the wind.

In fig. 2 the flue consists of a rectangular duct V having a sloping roof at the top and open at one side. The fume-outlet is cut in the top of the hood A (or, maybe, in one side). The wing or tail W is fixed over the duct and keeps the outlet turned in the direction towards which the wind is blowing. On the tail may be hinged a flap X, which is operated by the wind and automatically opens and closes the flap or valve G, which is hinged to the hood and operated by levers and connecting rods or wires passing through holes in the top of the outlet-duct. The force of the wind consequently regulates the area of the opening for the fumes through the duct.

Vertical Retort-Charger.

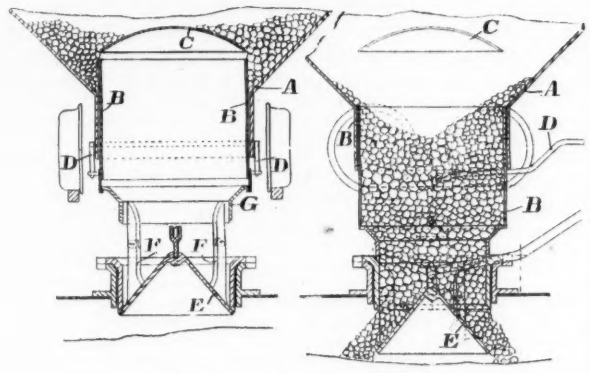
WADDELL, A., of Dunfermline.

No. 6113; March 10, 1914.

This invention, relating to the charging of vertical gas-retorts, has for its primary object to provide for the delivery of coal from a bogie into the retort "with a minimum loss of gas."

The vertical sections, at right angles to one another, show a bogie A, fitted with a movable sleeve B, normally serving as a stopper for the

discharge outlet from the bogie, and adapted, when the contents of it are to be discharged, to constitute a laterally closed conduit connecting the discharge outlet of the bogie with the charging opening of the retort. The sleeve is fitted to slide vertically in the bottom of the bogie, and when in elevated position forms, in conjunction with a stationary roof C contained within the bogie, a closure preventing any discharge of the contents. The sleeve is normally maintained in an elevated position by a slidable U-shaped bar D fitted to the bogie, the ends of which engage diametrically opposed pins on the sleeve. Fitted to the usual conical valve or bell E of the retort is a series of upright arms F, the upper extremities of which are connected with a ring G into register with which the sleeve B is brought.



Waddell's Vertical Retort Discharger.

When the bogie is in the required position, the bar D is withdrawn from engagement with the pins; the sleeve being now temporarily connected with the ring G, through the intermediary of inter-engaging flanges on the sleeve and ring—the sleeve being thus coupled to the bell. If, now, the valve E is lowered in the usual way, the valve, sleeve, and ring all move downwardly together as a unit; the coal passing down into the retort—the sleeve acting as a guide for the descending coal and also preventing any lateral escape of gas and ingress of air. When the contents of the bogie are discharged, the sleeve is lifted together with the valve, and the bar is caused to re-engage the pins; the sleeve being thereby retained in elevated position.

Projectors for Coal.

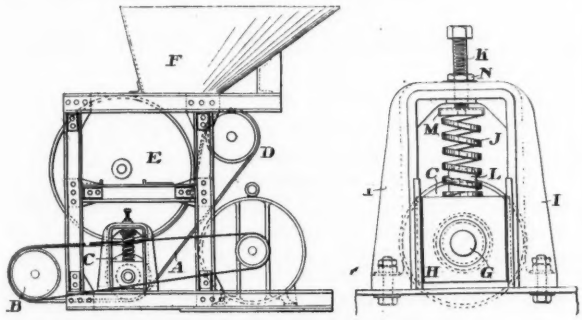
GIBBONS, W. G., of Victoria Street, S.W., and W. J. JENKINS AND CO., LIMITED, of Retford.

No. 15,561; June 29, 1914.

This invention relates to coal projectors of the type comprising an endless band or apron passing around pulleys and below a hopper which feeds the coal between the flanges of a pulley on to the apron. The object of the improved construction is that the machine "shall be enabled to withstand shocks from (for example) extra large lumps of coal, and so that the projector shall be specially applicable for bunkering coal on board ship."

One of the jockey pulleys over which the band or apron passes is mounted in resilient bearings that give under any sudden or excessive loads, so as to relieve the strains of the belt; the jockey pulley being rotatable in journals slidably mounted in frames and acted upon by springs, rubber blocks, or the like—means being provided for adjusting the pressure exerted by the pulley on the band or apron.

A side elevation of the projector and an enlarged view of the journal of the resilient adjustable jockey pulleys are given.



Gibbons' (Jenkins and Co.) Coal Projector.

The endless band A runs over the driving pulley B, the jockey pulley C, idle pulley D, and a pair of separated drums E, between which the coal from the hopper F passes as it is being projected by the band. The shaft G of the jockey pulley rotates in bearing blocks H slidably arranged in guide frames I attached to the baseplate or frame members of the machine. The pulley is pressed into engagement with the band by a spring J interposed between the bearing block H and the adjusting screw K. The spring is held securely in position by a projection L on the bearing block and a cap M having a central aperture in which the end of the adjusting screw engages. A locknut N is also provided to secure the adjusting screw in any desired position.

Washing Gases.

DAVIDSON, W. B., of Birmingham, and LIVERSEDGE, A. J., of Croydon.

No. 19,028; Aug. 25, 1914.

In their specification the patentees remark that in various forms of gas-washing apparatus the gas is caused to pass through a chamber, or a succession of chambers, in which liquid is sprayed by the action of centrifugal force on plates and so on; the liquids being picked up from the lower part of the chamber by scoops or conical tubes depending from the rotating members. In some cases the gas enters the washing

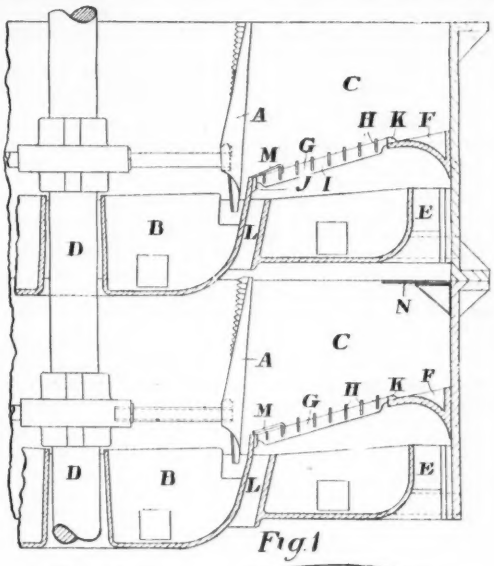
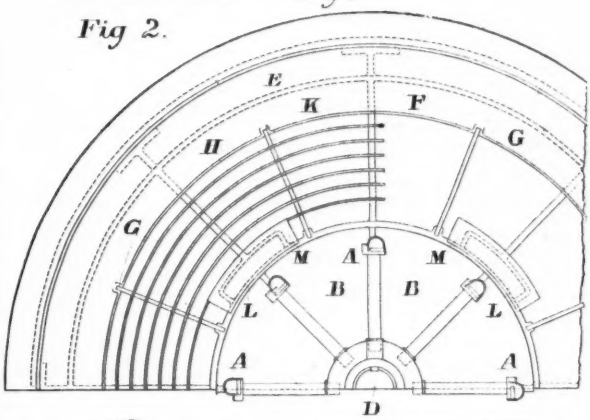


Fig 1

Fig 2.



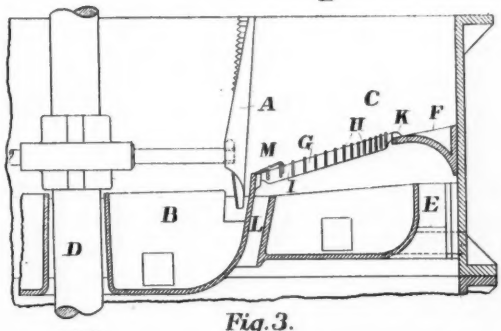


Fig.3.

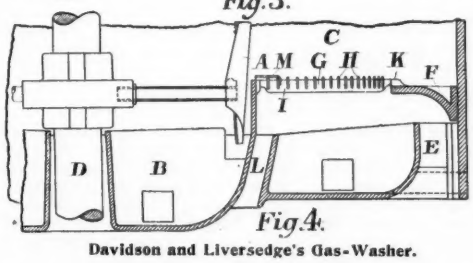


Fig.4.

Davidson and Liversedge's Gas-Washer.

chamber centrally, and after being deflected towards the sides leaves the chamber centrally at the top; in other cases, the gas enters the bottom of the chamber around the sides and leaves around the sides at the top.

The present invention refers to spraying apparatus provided with gas-passages around the sides, or between the sides and the centre. In

apparatus of this class the sprayed liquid, thrown in drops or fine streams from the sprayer, passes down the gas-passage and falls straight through the various chambers in a vertical apparatus, "or, to avoid this, overhanging deflectors are used which impose back-pressure upon the gas." The object of their invention therefore is to provide a baffle between the sprayer and the gas passage so as to prevent the sprayed liquid entering the gas-passage without opposing obstacles to the passage of the gas, which would impose back-pressure upon it. This construction further enables an additional washing of the gas to be obtained by the liquid streaming over the surfaces of the device.

Fig. 1 is a sectional view of two superposed washing chambers with the present invention applied. Fig. 2 is a plan; but at the right-hand side the plates or baffles forming the gallery or grid are removed to show the supports. Fig. 3 is a sectional view of one washing chamber with the plates or baffles forming the gallery arranged slightly differently. Fig. 4 shows a modification.

The gallery or grid is shown mounted in washing chambers provided with sprayers constructed in accordance with patent No. 9302 of 1914. This is for purpose of example only, as the present invention concerns merely the construction of the baffle. A is the spraying device raising liquid from the well B and throwing it in fine drops across the chamber C when the shaft D (on which the spraying device is mounted) is rotated. The gas-passage E is here shown around the side wall of each chamber; and above the gas-passage is the shaped deflector F, to guide the gas toward the sprayer and prevent it passing in too direct a manner to the gas-passage of the next chamber. The deflector also prevents liquid drops which are falling substantially vertically—for instance, drops rebounding from the side wall of the chamber—from entering the passage E. The gallery or grid G of baffles for protecting the gas-passage is mounted between the deflector F and the wall of the well.

As shown in figs. 1 and 2 the gallery or grid is composed of vertical or slightly inclined plates or rings H inserted in notches in radial bearer-bars or supports I, dropped into recesses J formed on the wall of the well and into recesses between lugs K formed on the deflector F. The inclination of the bars raises the rings or plates in a tier or gallery so that each successive plate towards the outer ring of the tier projects above the one within it. Thus drops that clear one plate or ring may impinge against the next or one more remote. In this way, while not preventing the free passage of the gas up or of the liquid down between them, the plates form an effective barrier to drops thrown outwardly and downwardly from the sprayer toward the gas-passage, or drops of low velocity thrown outwardly from the lower parts of the sprayer.

The liquid overflow passages L from one chamber to the next may be guarded by shields or plates M over the lower plates of the gallery.

The gas in its upward passage will be subject to the washing action of the thin streams of water trickling down the plates H; and "if these plates are of gauze or other openwork material, the surfaces exposed are increased, and this washing effect is increased." The plates may be of any suitable depth to give the best washing effect without interfering with the spraying; but, as an example, 3 to 4 inches may give a satisfactory form of apparatus.

As shown in fig. 3, the plates H may be spaced closer together at the parts of the gallery remote from the sprayer; while, as shown in fig. 4, the plates may all be in one horizontal plane, but should then be close together as indicated. The plates may each be built up of segments to form a complete circle, if the gas-passages are circular, or continuous strips may be arranged spirally to give the same effect as the plates shown. It will be seen that a further deflector N is shown near the upper part of the chamber C—to be employed if found desirable.

APPLICATIONS FOR LETTERS PATENT.

94.—Baynes, F. W., "Gas-generators." Jan. 4.
210.—Wegmann, E., "Compressing gases." Jan. 6.
218.—Rist, A., "Acetylene generators." Jan. 6.
245.—Hamill, W. W., "Liquid meters." Jan. 7.
345.—Westrup, C. J., "Oil gas." Jan. 8.
368.—Kent-Johnston, A. G., "Distance lighter." Jan. 9.
370.—Boughton, R. V., "Lighting fires and regulating temperature of materials by automatic gas-burners." Jan. 9.
371.—Potter, W. G., "Incandescent burners." Jan. 9.
379—Edwards, A., "Sulphuretted hydrogen recorders." Jan. 9.

Reduced Price for Coke at Lancaster.—Addressing the members of the Lancaster Town Council on the minutes of the Gas Committee, the Chairman (Sir N. W. Helme, M.P.) said they had received complaints that coke was being imported into the town from outside gas-works, and this was affecting the sale of their coke considerably. It was suggested they should reduce the price 1s. 8d. per ton; but after conferring with the Manager (Mr. C. R. Armitage), he felt he could not really agree to such a proposal. A Sub-Committee was thereupon appointed to look into the matter. They found Lancaster was subject to extraordinary competition, not regularly, but at certain times, from certain firms; and therefore it was decided to reduce the price 10d. per ton, and not 1s. 8d., which would involve a loss of £500 a year.

Doncaster Tradesmen and the Supply of Gas-Fittings.—At the last meeting of the Doncaster Tradesmen's Association, objection was raised to the clauses of the Corporation Bill giving power in regard to the sale of gas-fittings; and it was decided that, at the public meeting to be held subsequently to sanction the promotion of the Bill, resolutions should be moved requesting the deletion of the clauses. Accordingly, at the meeting it was proposed that clause 27, authorizing the Corporation to "sell meters and any fittings connected therewith," and clause 129, giving the Corporation authority, in connection with their electricity undertaking, to "sell, let for hire, and fix, repair, and remove electric fittings and appliances," should be deleted; and this was agreed to by a large majority. A poll was demanded, and the Mayor (Mr. S. Balmforth) said that he had no objection to it; but he warned the minority that the Chamber of Commerce would oppose the Bill in Parliament if the clauses indicated were included.

LEGAL INTELLIGENCE.

DISPUTE UNDER A TAR-CONTRACT ARBITRATION.

HIGH COURT OF JUSTICE—DIVISIONAL COURT.

(*Before Justices* Ridley *and* Lawrence.)

Friday, Jan. 15.

Yorkshire and Lincolnshire Tar Distillation Company v. Hasland Coking Company.

Mr. Gordon Hewart, K.C. (with him Mr. Waddy), said this was an appeal by respondents from an order of Mr. Justice Atkin, dated April 29, whereby he directed that Mr. C. A. Russell, K.C., who acted as Umpire in an arbitration between the parties, should state his award in the form of a Special Case. There had previously been an application to Master Chitty (under section 19 of the Arbitration Act, 1889) for a Special Case to be stated; but the Master refused to make the Order. From this decision the Tar Company appealed; and Mr. Justice Atkin directed the Umpire to state a Special Case. The facts were these: The respondents (the Tar Company) had entered into a contract with the Coking Company dated Sept. 22, 1910, whereby the Coking Company sold to the Tar Company their surplus make of tar for a period of three years commencing in July—the minimum quantity to be supplied being 3000 tons a year—at 24s. per ton, delivery at the rate of 70 tons per week, net cash for fourteen days' supply, payment to be made on the Saturday following receipt of statement, and a deposit of £250, on which sellers were to pay interest at the rate of 5 per cent. Under this contract, deliveries were made for a long time; and then difficulties arose, as the buyers did not pay promptly, and the deposit had become exhausted. The matter was then referred to arbitration; the question being whether the parties in default had by their conduct evinced an intention to be no longer bound by the contract. The arbitration occupied three days; and eventually the Arbitrators disagreed. Quite at the end of the proceedings, Counsel for the other side stated that his clients desired that the Umpire should state the award in the form of a Special Case—not that a Special Case should be stated on points of law. The Umpire said that he thought it was a request to which he ought to accede, when he (Mr. Hewart) suggested that the tribunal had been expressly constituted in order that the whole question should be determined once for all. The Arbitrators having disagreed, the matter was remitted to the Umpire to make the award. When he began to direct his mind to the making of an award in the form of a Special Case, he found he could not usefully do so, as it was entirely a question of fact; and he thereupon so informed the parties, but agreed to delay making the award in order that either party, if so advised, might apply to the Court. On Feb. 21 the Tar Company took out a summons before the Master, in which a request under section 19 was preferred for an order directing the Umpire to state a case on a series of questions. The summons came before the Master on March 23; and on April 7 he decided that the Umpire was right, and that he ought not to be required to do that which he thought it was impossible to do. This decision was appealed; and Mr. Justice Atkin thought that as a Special Case was desired, the Tar Company had a right to have one. He (Counsel) submitted that the real question was not whether it was physically possible to state a case, but whether one could be usefully stated for the opinion of the Court, as there was no question of law to be decided.

Mr. Shortt, K.C. (with him Mr. J. D. Crawford), for the Tar Company, supported the decision of Mr. Justice Atkin—contending that as mixed questions of law and fact were raised in the arbitration, his clients were entitled to have them decided by the High Court upon a Special Case stated by the Umpire.

Their Lordships failed to see any point of law raised in the proceedings upon which it was necessary to state a case; and they accordingly reversed the decision of Mr. Justice Atkin and restored the order of the Master.

The appeal was accordingly allowed with costs.

ACTION TO RECOVER ALLEGED ARREARS OF WAGES.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

(*Before the* Lord Chief Justice.)

Wednesday, Jan. 13.

Rowsell v. Metropolitan Water Board.

This action, which was put down originally to be heard before a Special Jury, was tried by his Lordship alone, as Counsel said it was a question for the Judge. The plaintiff was Mr. Edwin T. Rowsell, of Leyton, and he sued the Metropolitan Water Board for arrears of wages alleged to be due to him since November, 1906. Defendants denied liability.

Mr. E. Wilde, K.C., and Mr. E. Brown represented the plaintiff; and Mr. Holman Gregory, K.C., and Mr. Goodlands appeared for the defendants.

Mr. Wilde, in opening, said Mr. Rowsell was from 1892 in the employ of the East London Water Company, and when the Water Board was formed in 1904 he was taken over with the other employees of the Company. Plaintiff was at first a trenchman; but when, in 1899, inspection gangs were formed by the Company to prevent waste, he was employed on one of these gangs. For the extra work and expenses he was allowed an extra day's pay; and later, when he fulfilled further duties, he obtained a day and a half pay extra. This went on from 1904, when the Board took over the water supply, till November, 1906, when the Board intimated that the men would be paid the usual

wages and their expenses—the extra day's pay being stopped. Section 47 of the Water Board Act provided that all the servants in the employ of the Companies taken over were to remain in the service of the Board and receive the same wages so long as they performed the same services as before. Neither the plaintiff nor the Union to which he belonged had ever acquiesced in the action taken by the Board, though long negotiations had taken place on the subject. He did not say that the Act put a man in the position that he became a perpetual servant who could not be dismissed; but he did say that, so long as he was employed, he was entitled to the same wages as under the old Company.

Plaintiff went into the box, and said he was now doing the same work for 35s. weekly for which he was formerly paid at least £2.

Mr. HOLMAN GREGORY, for the defendants, said that for years the man had received the altered rate of pay, and he must be taken to have agreed in it. He suggested the proper claim would have been one of breach of contract.

His LORDSHIP said the main point was whether plaintiff was entitled to claim arrears of wages after the Board had given him notice that they were not going to pay at the old rate after a certain date.

Mr. WILDE asserted that this right was established by the section of the Act to which he had referred; otherwise there would not be the protection to the employees of the old Company that was clearly intended by the Act. He submitted that the object of the section was to prevent the wages of the employees being reduced while they were kept on under the Act.

Thursday, Jan. 14.

JUDGMENT.

His LORDSHIP, in giving judgment, said the plaintiff was taken over from the East London Water Company, with others, by the Metropolitan Water Board under their Act of Parliament. This took place on the appointed day (June 24, 1904), when plaintiff was being allowed an extra day's pay for extra work and expenses. This went on till Nov. 16, 1906, when the method of pay was changed, and plaintiff said this caused him loss, for which he now claimed compensation under section 47, sub-section 1, of the Water Board Act. It was clear that the plaintiff and his Union always protested against the change by which it was said plaintiff lost about 8s per week; and he could not hold that plaintiff ever gave up any right he had in the matter. Acquiescence must always be a matter of intention; and he could not find that Rowsell ever acquiesced in the change. Plaintiff said that the words of the section put him in the position that as long as he performed for the Board the same duties as he performed for the East London Company no change could be made in his wages. He said he performed these duties from Nov. 16, 1906, to the present time; and he (his Lordship) found as a fact that the plaintiff did perform such duties. The contention for the plaintiff was that the section on which the claim was based gave everyone who performed the same duties under the Board as they did under the Company taken over the right to the same wages; but this contention did not give effect to a later section which provided that if an officer suffered loss in consequence of the Act then he was entitled to compensation, and he might claim under a certain Local Government Act. In his opinion, this section showed that Parliament never intended that there should be litigation in the ordinary sense in such matters. If it was said therefore that there was direct pecuniary loss in consequence of the Act, he did not think that was a matter in regard to which an action could lie. When it was seen that there was a special method of determining compensation by a section which also named the tribunal, and which added that the decision of the Treasury was to be final, he did not see how there could be said to be a right of recovery in the Courts. In his opinion, the plaintiff's case failed on the substantial ground that there was no right that he could find in the Act by which plaintiff was entitled to say that his rate of pay could never be altered so long as he performed the same duties. He thought that the provision in question meant that when the transfer took place, and the old servants were taken over by the new body, they were to receive the same pay as long as they did the same work; but he saw nothing in the words to prevent the new Board from saying, after they had taken over the undertaking, that certain rates of pay were too high, and must be altered. The East London Company, it was admitted, were entitled to discharge plaintiff at a week's notice, and so, in his opinion, were the Water Board. He must add that in any event compensation under the section could only be given by any direct pecuniary loss caused by the coming into force of the Act. It could not be said that this loss was direct loss caused by the Act—in fact, it was not—and therefore there was no right to recover under the section. But the plaintiff's case failed also on the broader ground; and he must therefore dismiss the action with costs.

Mr. HOLMAN GREGORY said he would ask for judgment with costs; but he was instructed that if there was no further litigation in the way of appeal, the Board would not press for costs.

His LORDSHIP said he was very glad to hear that.

Mr. GREGORY added that the action of the plaintiff and the Union had been very correct throughout; and defendants recognized this.

Judgment was then entered for the defendants with costs.

COWDENBEATH GAS COMPANY AND WATER-RATES.

In the Court of Session last Friday, Lords Dundas, Mackenzie, and Cullen had before them a special case presented by the Burgh of Cowdenbeath and the Cowdenbeath Gas Company, in which the Court were asked to decide the proportion of water assessment the burgh authorities were entitled to charge the Company. The practice of the authorities has been to assess the Company for water at the full annual value of their above-ground property as appearing in the valuation roll, and at one-fourth of the annual value of their under-ground works. Since the formation of the burgh in 1890, the Company have been assessed as owners and occupiers. They were dissatisfied with the water assessments, and have withheld payment for the last three years; and the question was as to whether the burgh were entitled to assess the Company for water purposes on the full annual value of their works above-ground, or only on one-fourth. The question depended on the interpretation of a series of statutory provisions.

Mr. Murray, K.C., and Mr. D. P. Fleming represented the burgh authorities; Mr. Macmillan, K.C., and Mr. M'Gregor Mitchell appeared for the Company.

The Court decided that the burgh were not entitled to assess the Gas Company for water purposes on the full annual value of their undertaking above-ground, but only on one-fourth. This conclusion was based on the Burgh Sewerage Act, 1901, which abolished the old special water district, in which the full water assessment was imposed on the undertaking so long as debt remained, and created a new scheme of assessment, fusing the special water supply district in the burgh, and authorizing an assessment for water on only one-fourth of the annual value of manufactories such as gas-works above-ground.

Liability for a Gassing Fatality.

At the Rochdale County Court, on Friday, a claim was made by Bridget Haggerty against the Rochdale Corporation, on account of the death of her daughter, Annie Carroll (a widow), upon whom she was partially dependent. On Nov. 14 last, Annie Carroll retired about midnight, and was not seen all the following daytime. An entrance to the house was effected in the evening, and she was found dead on the bed. Her brother, who also lived in the house, was unconscious on the bedroom floor. He was taken to the infirmary and recovered. When the Corporation workmen were fetched, it was discovered that there was a breakage in the street-main. On behalf of the applicant, Mr. J. Bright Clegg stated that the woman died from the effects of inhaling gas. The case had been settled by the payment by the Corporation of £25 and costs.

Liability for Damage to a Prepayment Meter.

At the Stockport County Court, before his Honour Judge Reginald Brown, K.C., the Stockport Corporation claimed 3s. 1d. from Thomas Jackman, in respect of repairs to a prepayment gas-meter damaged while in his custody. The Deputy Town Clerk (Mr. J. Hall) explained that the meter was broken open by a burglar, and the money extracted. The defendant, however, was responsible, as he had signed an agreement to the effect that he must exercise the strictest diligence, and make good or pay for any damage to the meter. The defendant said he could not be responsible for a burglar breaking into the cellar after midnight and damaging the meter, which was placed in the cellar for the convenience of the Gas Department. He had exercised "strict diligence." The landlord might as well have made him responsible for any damage done by a burglar to his house. He had been a gas consumer for twenty years. His Honour remarked that the defendant could have had an ordinary meter; but he preferred a prepayment one. The question was whether he could get out of the agreement he had signed, in which he contracted to "pay for or make good" any damage to the meter. Only what was called "the act of God" or damage done by "the King's enemies" freed him from liability; and neither of these things could be urged in the present case. Defendant said there were thousands of slot-meters in the town; and this was the first instance in which the Corporation had proceeded against anyone. Mr. Hall: All the other consumers have paid without any demur. His Honour decided that defendant was responsible; and gave judgment for the Corporation for 3s. 1d. damages.

Dispute as to a Differential Charge for Gas.

Last Thursday, at the Walsall County Court, before his Honour Judge Smith, an action was brought by the Ogley Hay and Brownhills Gas Company against a Walsall Wood tailor, named Emery, to recover £11 15s. for gas supplied. In opening the case for the plaintiffs, Mr. A. Cotterell explained that the action was brought in respect of an account which extended back a period of over six years. There was a point in dispute in the case as to the rate per 1000 cubic feet at which the defendant was entitled to a supply of gas. Previous to 1909, he was charged 3s. 3d.; but in that year the plaintiffs obtained a Provisional Order which stipulated that there must be no differentiation between consumers who used gas under like circumstances. The plaintiffs agreed to allow a reduced rate of 3s. 3d. to manufacturers who consumed gas for power purposes and in large quantities; but to all other consumers they charged a uniform rate of 3s. 9d. per 1000 feet. Defendant, however, took exception to the increased charges, and contended that, as he was the biggest consumer in the district next to the manufacturers, he was entitled to the same concession as they had. On behalf of the defendant, Mr. H. A. Tucker urged that there had been a special contract between his client and the Company, and, further, that the notice given of the altered rates could not be regarded as one terminating his contract, because it was too vague. Defendant, in evidence, stated that when notice was given to him of the alteration he was told it did not affect him. He admitted that he received his supply of gas for trade and domestic purposes through the same meter. In giving judgment for the plaintiffs for any amount found to be due to them at the lower rate, his Honour said he took the view that a general notice that there would be a uniform price of 3s. 9d. per 1000 cubic feet, except when gas was used for power purposes, was not sufficiently definite to terminate the defendant's special arrangement; and he also accepted a statement of the defendant that no verbal notice of a more definite nature was given him by the plaintiffs.

Mansfield Gas Undertaking.—An attempt has been made recently by a neighbouring authority to ascertain if there was any disposition upon the part of the Mansfield Corporation to dispose of certain rights of gas supply. But the reply to the inquiry, which emanated from the Mansfield-Woodhouse Urban District Council, has been emphatically in the negative; those responsible for the administration of affairs in the prosperous North Notts township indicating that there is no inclination whatever to dispose of the Woodhouse district part of the municipal undertaking.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA MARKET IN THE PAST YEAR.

Messrs. Bradbury and Hirsch's Review.

We have received a copy of the "Review of the Market for Sulphate of Ammonia" in the past year which has been issued by Messrs. Bradbury and Hirsch, of Liverpool. It contains, as usual, a good deal that is of interest to "JOURNAL" readers.

In their opening remarks, Messrs. Bradbury and Hirsch say that, in entering upon a review of the sulphate of ammonia and nitrate of soda markets for the past year they are very conscious of the disabilities under which they labour by reason of the terrible war now devastating the Continent of Europe. They have always thought that the chief value of the "Review" was the setting-out, with something like completeness, of the production and consumption in the world, the factors likely to make for or against larger output and consumption, and the development of the production of kindred material calculated to have a bearing upon the course of the markets. Manifestly it is not possible to give statistics with anything like completeness at the present time; those for the Continent not being obtainable since the outbreak of the war. They are therefore reluctantly obliged to confine themselves to an incomplete retrospect, and to the setting-out of the present situation as nearly as may be—expressing the fervent hope that at the end of another year the international situation may be such as to permit them to write their "Review" more nearly on a level with those for other years.

NITRATE OF SODA.

Dealing first with nitrate of soda, Messrs. Bradbury and Hirsch say the situation at the close of 1913 did not, in their opinion, promise well for the maintenance of prices over the forthcoming season. Notwithstanding curtailment of production during the previous four months, the visible supply was still 107,000 tons larger than the visible supply at the end of 1912; and they were obliged to dismiss as a negligible quantity the chances of the agreement to curtail production being extended beyond the end of January. Stocks on the west coast were not substantially above the average at the end of December. From the point of view of probable consumption the outlook was, on the whole, more promising than that at the end of 1912. The United States had largely over-supplied themselves over the first six months of 1913, and, as they were already more largely committed to the use of sulphate of ammonia than in that year, it was practically certain that they would not require larger, even if as large, shipments of nitrate of soda for their 1914 season, notwithstanding the high price of cotton. In Europe, however, and more especially in Germany, there had been a very marked shrinkage in the consumption of nitrate of soda during the first six months of 1913, owing, no doubt, to inflated prices. But the more normal figures current at the end of the year seemed to justify a return to something like the 1912 level of consumption. Even then Messrs. Bradbury and Hirsch thought that the probable supply would be ample, and that, in view of the position of sulphate of ammonia, no improvement in prices could be expected over the spring months. The output of sulphate had so far increased that in November the German Syndicate had deemed it prudent to reduce prices very substantially both for home consumption and for export, and for delivery ahead as well as for prompt delivery. Producers in the United Kingdom were rather slow to follow this lead—unfortunately for them, as it proved to be a correct one. They eventually had to follow it; and account had also to be taken of the increasing output of other nitrogenous fertilizers.

The actual supply of nitrate of soda for January-April proved to be 1,381,000 tons; deliveries from United Kingdom and Continental ports being 1,194,000 tons, and stocks at these ports on the 30th of April 187,000 tons. The total was 95,000 tons more than Messrs. Bradbury and Hirsch counted upon. The increase was mainly due to failure in demand for the United States; the shrinkage in shipments in this direction over the first six months of the year being about 80,000 tons. It was, however, partly due to the attitude of producers, who had no confidence in the stability of prices, and who consequently rather pressed supplies upon the market. In like manner traders fed the market freely in Europe, without much regard to prices, and so brought about a consumption unprecedented in volume in the history of the nitrate of soda trade.

Deliveries in January last year were only slightly in excess of those in January, 1913. Those in February, however, easily beat any previous record, the increase upon the corresponding month of 1913 being no less than 135,000 tons, or about 57 per cent. In March there was a further increase of 33,000 tons; but deliveries in the following three months were only on about the level of those in the corresponding months in 1913. Messrs. Bradbury and Hirsch think that such a record is a tribute to the business acumen of all engaged in the trade in frankly recognizing the dominant factors in the situation—the abundant supply, the resumption of unrestricted production, and the failure in demand for the United States. It is probable, too, that the increased supply of sulphate of ammonia and of other nitrogenous fertilizers was a point kept well in sight. Not even in February was there more than a fractional advance above the opening price for the year, which was 10s. 6d. per cwt. On the other hand, there was not at any time up to the end of June a decline of more than 7½d. per cwt., though increased supplies to the extent of 173,000 tons had been got rid of within the six months, and though output on the West Coast had been unrestricted after the end of January, and had very substantially increased in April, May, and June. There is no record of deliveries from European ports since June.

The demand for nitrate of soda in January was quite satisfactory for the season of the year; but, supplies being abundant, there was a decline in price from 10s. 6d. to 10s. 4½d. per cwt. In February, owing to exceptionally heavy deliveries, there was a recovery to 10s. 7½d.; but, notwithstanding well-sustained demand, the price at the end of March again became 10s. 6d. In April there was a decline to 10s. 1½d. In May 9s. 10½d. was accepted; and this remained the price up to the end of June. The average price for the six months worked out to 10s. 3½d. per cwt.; and, although this was 1s. 3d. per cwt. below the average for January-June, 1913, Messrs. Bradbury and Hirsch, think that, having regard to the circumstances to which they have referred and to the still greater shrinkage in the values of other nitrogenous materials, the result cannot be regarded as altogether unsatisfactory. There was no special feature in the market in July; but the shadow of over-production had appeared, and, as no effective steps had been taken to deal with production, the outlook was not inspiring. The price remained 9s. 10½d. per cwt. through the month. With the outbreak of war in August, everything in the nitrate of soda trade was upset; and though the authors give the Liverpool prices, as hitherto, they do not think they can have much value for the purposes of comparison. The price was at once advanced to 11s. 3d. per cwt.; but at the end of August it was put down to 11s. In September there was a decline to 10s. 4½d., and in October 10s. became the price. By the end of November 9s. 6d. was being accepted; and the closing price for the year was 10s. per cwt. The average for the six months works out to 10s. 1½d. per cwt., or 6¾d. per cwt. less than the average for the corresponding period in 1913.

The situation on the West Coast was not very comfortable at any time during the year; producers not having been a united family. Since the beginning of August, however, it has been disastrous and deplorable. The price free alongside declined to 7s. 10½d. per quintal in January; and this figure was about maintained through February. In March there was a recovery to 7s. 11d., owing to exceptionally heavy deliveries in Europe; but towards the end of the month 7s. 9d. had to be accepted. In April the price fluctuated between 7s. 6½d. and 7s. 6d.; but by the end of May it was down to 7s. 5d. After touching 7s. 3½d. in June, it recovered to 7s. 5d.; but by the end of July as low as 7s. 1½d. had been recorded. The average price for January-June works out to 7s. 7⅜d. per quintal, or 4¼d. below the average for January-June, 1913; and seeing that a state of war among producers existed over practically the whole period, Messrs. Bradbury and Hirsch think that prices were very well sustained. The conditions prevailing on the West Coast since July have been so far abnormal that they consider there would be no advantage in giving the prices free alongside for July-December.

The production during the year is estimated to have been about 2,420,000 tons, or 300,000 tons less than in 1913; but no profitable deduction can be made from this comparison, owing to the altered circumstances which a state of war in Europe has brought about. Stocks on the West Coast are estimated to be about 1,120,000 tons—an increase of 625,000 tons within the year. The increase since June has, however, been only about 333,000 tons, and that mainly in July, August, and September, before curtailment of production could be made effective. The significance of these figures cannot, however, be estimated unless in relationship with others; and the authors remark that though it is no doubt venturesome on their part to attempt to estimate these figures, they will risk it, since no one else has made the attempt. Put concisely, their estimate may be stated as follows:

		Tons.
Proportion of stock in Europe outside Germany, Belgium, and Austria-Hungary at end of June		80,000
Quantity afloat to Europe at end of June .	260,000 tons	
Deduct quantity to arrive in Germany, Belgium, and Austria-Hungary in July .	50,000 ,,	
		210,000
		290,000
Add shipments to Europe, July-December		384,000
		674,000
Shipments to Europe in 1915, and arriving before the end of April . . . . . say		100,000
		774,000
Deduct consumption in Europe outside Germany, Belgium, and Austria-Hungary, July-December, 1914 . .		170,000
		604,000
Do., do., January-April, 1915		400,000
		204,000

Messrs. Bradbury and Hirsch point out that deduction must be made for losses at sea, for the quantity sheltering in neutral ports, for cargoes sunk, and for cargoes which may have got through the blockade in the North Sea and the Adriatic; but they think that 74,000 tons should cover all this, and that there may be a margin of available supply at the end of April of 130,000 tons. It is more than likely that a certain quantity will still find its way into Germany and Austria-Hungary through the blockade and through neutral countries; but if allowance is made for this, they consider there will remain a surplus supply for Europe at the end of April of fully 100,000 tons. In the main, Germany will depend upon atmospheric nitrogen compounds from Northern Europe to replace her shortage of nitrate of soda. If their figures are even approximately correct, there will be no scarcity, unless locally, owing to the uneven distribution of supplies. The visible supply for the United States is only 50,000 tons, against 89,000 tons at the end of 1913; but, owing to abundant stocks on the West Coast, this shortage cannot, it is thought, affect the European market, except in so far as larger requirements in 1915 may occasion keener competition for available tonnage.

SULPHATE OF AMMONIA.

Coming to sulphate of ammonia, Messrs. Bradbury and Hirsch remark that when summing up the situation at the end of 1913 they were not able to take a sanguine view of the outlook for the fertilizing season of 1914, though, owing to the falling-off in the demand for coke—the primary product of carbonizing works—it was not anticipated that the increase in the output of sulphate of ammonia in Germany would be on anything like the scale of the increases in 1913 and preceding years, or that there would be any important increase in the United Kingdom. They thought that the prospective supply of nitrate of soda was suffi-

ciently abundant to put out of the question a conservative attitude on the part of that trade; that consequently a lower level of prices for nitrate must be contemplated as the season progressed; and that this must prejudicially affect the sulphate market. They think it was pretty clear that this view was in the mind of the German Syndicate, and that their actual and prospective supply of sulphate was going to be more than they could find room for on their existing markets. For these reasons they had, in November, as they pointed out in their last "Review," broken their prices, and entered more aggressively into the export market than ever before, offering freely for delivery over and beyond the forthcoming spring months. At the same time they took measures calculated to cement and extend their home and continental trade. The Continent was thus practically barred against United Kingdom production, apart from the execution of contracts made in advance; and German competition had already begun to make itself felt in the sugar colonies, in United States cotton ports, in the Pacific, and in Spain and Italy. In view of these facts, they did not see how the level of prices at the end of 1913 could be raised over the spring months of 1914, if even it could be maintained.

In order to show the actual trend of exports, Messrs. Bradbury and Hirsch give tables of shipments drawn up as in previous years. The following are the totals for the past and the preceding year:

	Year 1914. Tons.		Year 1913. Tons.
France, Germany, and Belgium	6,945	..	23,521
Spain and Portugal, Italy, and the Canaries	72,855	..	70,237
Holland, Java, British Guiana, the West Indies, and Mauritius	86,510	..	60,275
Japan	87,776	..	114,684
United States	43,651	..	37,067
Other countries	16,140	..	18,920
Total exports	313,877	..	324,704

Statistics as to Prices.

Though when the year 1914 opened stocks in the hands of producers were not much more than normal, and though the rate of increase in output had slackened, Messrs. Bradbury and Hirsch say there was nowhere any keenness on the part of buyers to make further purchases. As a matter of fact, January requirements had been largely covered by purchases made in advance; and the action of the German Syndicate in November, in dropping prices so abruptly, had done much to destroy the confidence of buyers in the future of the market. There was consequently a fall in prices from £12 16s. 3d per ton at the outset to £12 5s. per ton in the middle of January; but the necessity for completing the month's requirements prevented any further decline. In February, the very heavy shipments in January having left available supplies rather bare, and buying having proceeded steadily, there was a recovery to £12 12s. 6d. per ton by the third week; but there was a relapse to £12 8s. 9d. towards the close. There was also a slight recovery in March—the month's requirements being very heavy. But supplies proved to be more than enough, and the closing value was down to £12 5s. per ton. April was altogether disappointing. Continental demand had shrunk to almost nothing, while German and Belgian competition had made itself more keenly felt in the sugar colonies, in the Pacific, in Japan, and in the United States; so that there was an actual shrinkage of nearly 5000 tons in the month's exports compared with those in April, 1913. Nevertheless, the decline in prices was not more than 1s. 3d. per ton. This, however, did not represent the true state of the market. Prices were only sustained at the cost of accumulating supplies; and the reckoning came in the next month. In May there was a further shrinkage of about 4700 tons in the exports, and a drop in price to £10 13s. 9d. per ton—that is to say, a fall of £1 10s. per ton within the month. In June the price fell to £10 7s. 6d. per ton; but there was an improved demand towards the close, and a recovery to £10 10s. per ton—the shipments being nearly as large as those in June, 1913.

Messrs. Bradbury and Hirsch state that for such a collapse in prices as this it is necessary to look back as far as 1895. And yet, when all the facts of the case are considered, they think it is impossible to see how some such catastrophe could have been avoided. A Continental market glutted with nitrate of soda, rendering it necessary to accept rapidly declining prices, may be mentioned in the first place. There was, in fact, an increase of 134,000 tons in the deliveries of nitrate from Continental ports in January to June, compared with the deliveries over the same period in 1913. And there was the larger output of synthetic sulphate of ammonia and other atmospheric nitrogen compounds to deal with, the extent of which the firm have not been able to ascertain. So that Germany and Belgium together found it necessary—or, at all events, convenient—to export some 41,000 tons more sulphate of ammonia in January to June last year than they exported in the corresponding period of 1913. Eliminating the extra 8500 tons imported by Belgium from Germany, there was still a net increase of 32,500 tons in the exports from the two countries.

There was a better demand in July, more particularly for Spain and Java, and a steady improvement in prices up to £11 per ton. With August came the war, and with it a financial situation unique in the history of commerce. Of course, contracts made for August shipment had to be fulfilled so far as shipping facilities rendered it practicable; but there was very little new business entered into during the month, with the consequence that shipments shrank to the extent of 4285 tons, and the price of sulphate dropped to £10 11s. 3d. per ton. In September business was on more normal lines; but it was still hampered by financial and other considerations, and the price fell to £10 6s. 3d. per ton. The elimination of Germany and Belgium from the export market began to make itself felt in October, there being no countervailing increase in British production; and there was a recovery to £10 16s. 3d. per ton. Like conditions prevailed in November; but there were some counter-influences at work. For instance, the unfortunate position of the cotton-growing industry in the Southern States of America, brought about by the war, had rendered it necessary to cancel contracts for sulphate of ammonia in many cases, and to get shipments postponed to a later date in others. But against this was the fact that contracts originally placed in Germany had in many cases to be covered in the United Kingdom. Consequently by the end of the month the price had advanced to £11 per ton. In December it became more generally realized that Germany and Belgium were not only out of the export market, but that they must remain out of it for a long time, and that there could be no adequate compensation in increased output elsewhere during the coming spring season. From the outset, therefore, there was increased demand; and this being well sustained there was an advance of £1 2s. 6d. per ton within the month—the closing price being £12 2s. 6d. per ton f.o.b. Hull.

The average price of sulphate for January-June was £11 17s. 4d. per ton, or £1 16s. 3d. per ton below the average for the first half of 1913. The average for July-December works out to £10 16s. 10d. per ton, or £2 4s. 8d. per ton below the average for the corresponding period of the previous year. The average price for the year is therefore £11 7s. 1d. per ton, or £2 0s. 5½d. per ton less than the average for 1913. Messrs. Bradbury and Hirsch think the result will, no doubt, be regarded by producers as disappointing; but, having regard to the vicissitudes through which the market has passed, they do not see that a higher average could have been expected. They say that but for the war it is certain that a lower average would have had to be recorded. In their opinion producers entirely failed to grip the true situation late in 1913 and in the earlier months of 1914. They say "they did not seem to realize the significance of the very much larger supply of nitrate of soda, of the much larger output of sulphate of ammonia in Germany in 1913, and of the rapidly increasing output of other nitrogenous fertilizers in Germany and elsewhere, and they allowed German producers of sulphate of ammonia to get well in front of them, both in the export and continental markets." An increase in German exports of 31,000 tons from January to June, against an actual shrinkage of 1239 tons in those from the United Kingdom over the same period, is, they consider, sufficiently significant. The markets invaded were the sugar colonies, the United States, Japan, and the Pacific, the larger takings of Holland and Belgium being in the main no doubt for export.

Statistics of Production.

The output of sulphate of ammonia in Germany in 1914 was still increasing (though not at a rapid rate, owing to slackness in demand for coke) up to August. Under existing circumstances, Messrs. Bradbury and Hirsch say it is impossible to get an estimate of the year's production; but for their present purpose this does not greatly matter, as it is not likely to find its way into the world market. The same remarks apply to Belgium. The French output probably decreased somewhat; and as France has in recent years drawn part of her supply from Belgium and Germany, she may require larger quantities from the United Kingdom, if financial and other exigencies admit. It is estimated that the output in the United States last year was 183,000 tons—a decrease of 12,000 tons upon 1913. The output in the United Kingdom in 1913 proved to be 432,000 tons—an increase of 44,000 tons upon 1912. It was mainly from carbonizing works, and really represented greater capacity within two years; most of the works being stopped in March, April, and May, 1912, by reason of strikes at the collieries and the consequent dearth of coal, and the larger recourse to water gas at the different gas-works from the same cause. There was nothing in 1913 to interfere with continuous operation at the carbonizing works; and, owing to the dearness of oil, the use of water gas was much reduced, so that the output of sulphate of ammonia from gas-works also showed a marked increase upon that in 1912. The production of ammonia, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom during 1914, is estimated at 421,000 tons, apportioned as follows:

	Tons.
Gas-works	177,000
Iron ,,	19,000
Shale ,,	62,000
Coke and carbonizing works and producer gas	163,000
	421,000

Of this quantity, Messrs. Bradbury and Hirsch estimate that England contributed 295,000 tons, Scotland 123,000 tons, and Ireland 3000 tons. The production (in tons) the previous four years was as follows:

	1913.		1912.		1911.		1910.
Gas-works	182,000	..	172,000	..	169,000	..	168,000
Iron ,,	20,000	..	17,000	..	20,000	..	20,000
Shale ,,	63,000	..	62,000	..	61,000	..	59,000
Coke and carbonizing and producer gas	167,000	..	137,000	..	135,000	..	120,500
Totals	432,000	..	388,000	..	385,000	..	367,500

Their estimate of production in the United Kingdom in 1913 was below the mark by 12,000 tons, 10,000 tons of which was an underestimate of the output from carbonizing works, though the figures were very carefully collected from carbonizers. They say it is quite clear that some of the estimates must have been very much under the actual. Their estimate of home consumption, therefore, was decidedly too low. It is probable, too, that stocks were under-estimated. This, they think, might well be, as with the great extension of carbonizing it is quite possible for many thousands of tons to exist and yet be out of sight. Home consumption might have been as much as 105,000 tons; and, if so, the stocks in the hands of producers and in transit to shipping ports would be 24,000 tons. Assuming this, the account for 1914 will stand as follows:—

	Tons.
Stocks brought forward from 1913	24,000
Production during 1914	421,000
	445,000
Exports during 1914	314,000
Home consumption (for all purposes) in 1914	106,000
Stocks to carry forward into 1915	25,000
	445,000

Prospects of the Market.

The portion of the "Review" in which Messrs. Bradbury and Hirsch deal with the prospects of the market is specially interesting, in view

of the present disturbed condition of European affairs. We therefore give it in full:

It would be quite useless to speculate upon the probable output in Germany, or indeed in any part of the Continent, as whatever supplies may be they can only find access to the world market through Holland and Italy; and it is not likely that exports on any extensive scale can be sent through these countries under present conditions, even if supplies are available. We therefore think that we may dismiss Continental production from our consideration. We did not anticipate that there would be a very large increase in the output in the United Kingdom in 1914, for the reason that the demand for coke had slackened, and the prospects of improved demand were not rosy. Demand was, in fact, so far unsatisfactory during the first half of the year that ovens had to be closed-down. With the closing of the German exports, however, prospects improved; but financial and transport conditions have prevented a rapid improvement in export demand for coke, and delayed the resumption of high-pressure working at the carbonizing works. But an increased output of sulphate of ammonia must be expected from this source. The unsatisfactory condition of the cotton manufacturing and other industries has prevented any increase in the output from gas-works; but this is righting itself, and the industries are getting on to normal lines—so far as they can be normal when a state of war exists. The condition of trade in the United States has not been all that could be desired; and the estimated output of sulphate of ammonia in 1914 is only 183,000 tons, against 195,000 tons in 1913. The prospects of the market must therefore be considered from the point of view of output in the United Kingdom and the United States; the output outside these two countries and available not being enough to appreciably affect the market. As the whole of the United States output is required in the home market, the problem is further narrowed, and may be considered from the point of view of United Kingdom supply.

We may now take up the question of consumption; and we will deal with the Continent (France, Belgium, and Germany) first. Within the first four months of 1914, the shipments from the United Kingdom amounted to only 5409 tons—3108 tons being to Germany. If we were to assume that none would be shipped in this direction during the next four months, the fact could not appreciably affect the market; but we need not assume it. Within the same period France took 3648 tons from Germany and 1521 tons from Belgium—together 5169 tons; and it is practically certain that some, if not most, of this will have to be replaced by British make in 1915. The exports from Germany and Belgium, January-April, 1914, to Holland and the Dutch East Indies were nearly 30,000 tons. Will they reach this figure within the same period in 1915? We do not think there is the remotest chance of it. We do not think Germany will have any sulphate of ammonia to spare; and with her nitrate of soda supply cut off, she will no doubt have greater recourse to the use of atmospheric nitrogen compounds within her reach. Belgium will, of course, be out of it altogether. Then the United States, Japan, and the Pacific took among them nearly 20,000 tons from Germany and Belgium in January-April, 1914. Will these countries be able to get any within the next four months? We think not. In fact, it is within our knowledge that contracts have had to be cancelled, and substituted in the United Kingdom; and it seems quite clear that further requirements will have to be filled by British production. Spain will have to depend entirely on the United Kingdom for supplies; while Italy has for some time been anxious to buy from the United Kingdom, but reluctant to pay the advanced prices required.

What promised to be a highly satisfactory United States cotton season has proved to be a disastrous one, owing to the war in Europe; and cotton planters have been passing through a more trying time than any they have experienced since their own Civil War. Planters have not been able to convert their cotton into money, except at ruinous prices; and fertilizer merchants have not been able to collect their money from the planters, and, in many cases, have had either to cancel their contracts for sulphate of ammonia, made before war broke out, for forward delivery, or to get shipments postponed. Nevertheless shipments to the United States within the past six months have been almost up to the level of those for July-December, 1913; and as further large contracts for shipment over the spring months are known to have been made, we do not look for any shrinkage in shipments in this direction. There will be no shipments from Germany, as was the case last season; nor will the Pacific be able again to draw its supplies from this source. There has been a marked shrinkage in exports to Japan within the past six months; and it is by no means clear whether this will be partly made good during the early months of 1915. But there will be no drawing of supplies through Belgium. Then there is in the price of sugar and all cereals every inducement to fertilize on the most liberal scale outside the war area. We therefore look for a well-sustained demand for sulphate of ammonia; and because Continental production must be out of the running, we look for a still higher level of prices over the coming season.

There will, of course, be an ample supply of nitrate of soda outside the Continent; but inasmuch as this does not seriously compete with sulphate of ammonia outside the Continent, the course of the market is not likely to be much affected by nitrate of soda prices.

The Course of the Market.

The "Review" concludes with a record of the course of the market month by month. One table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 3, sulphate was £12 13s. 9d., and nitrate £10 10s. per ton; on April 4, the prices were £12 3s. 9d. and £10 10s.; on July 4, they were £10 15s. and £9 17s. 6d.; on Sept. 5, £10 10s. and £10 15s.; and on Dec. 26, £12 and £10 respectively. Another table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1905, 10s. 9½d.; 1906, 11s. 4d.; 1907, 11s. 2d.; 1908, 10s. 2½d.; 1909, 9s. 9d.; 1910, 9s. 4½d.; 1911, 9s. 10⅜d.; 1912, 11s. 1d.; 1913, 11s. 1d.; and 1914, 10s. 2½d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 48 years—1867 to 1914. The following are the averages for the past ten years: 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.; 1908, £11 12s.; 1909, £11 5s.; 1910, £12 3s. 2d.; 1911, £13 15s. 3d.; 1912, £14 7s. 9d.; 1913, £13 7s. 8d.; and 1914, £11 7s. 1d.

THE ILFORD PREFERENTIAL CHARGES CASE.

A Settlement Reported.

To-day was fixed for the trial, in the Chancery Division of the High Court of Justice, of the action brought by the Ilford Gas Company against the Urban District Council, with reference to preferential charges for electricity, and the offering of certain electrical apparatus for sale or hire; but a writer in the "Ilford Guardian" states that he is informed from a very good source that the dispute has been terminated, and that the action has ended in favour of the Company.

This statement, he follows up in these words: "If I am correctly informed, it would appear that the view taken by the Gas Company is correct, and the Council have agreed to pay the cost of the proceedings up to the settlement. Of course, nobody imagines that this will be the end of the matter, even if the Company have scored up to the present. What will probably happen is that the first time the Ilford District Council have occasion to apply to Parliament for extended powers, opportunity will be taken to obtain the necessary authority for carrying on those transactions which are necessary for successful trading. The Gas Company realize this, no doubt, and will doubtless make the most of the opportunity while it lasts. One thing is quite obvious, the Ilford District Council cannot hope to successfully carry on the business of supplying electric light and heat, if they are to be hampered by restrictions. As this is the ratepayers' business, it is to our interest that it should be carried on without a loss. A great deal of money has been invested in the undertaking; and no matter whether our private views may be in favour of municipal trading or not, we cannot, as sensible people, stand by and see the business making a loss which we should be responsible for. I do not grudge the Ilford Gas Company their triumph. They have shrewd, level-headed men in control, and they are entitled to take all legitimate means to compete successfully with a dangerous rival. But it will rest with members of the Ilford Council to show themselves equally shrewd in removing restrictions at the earliest possible moment."

VERTICAL RETORTS FOR GOOLE.

The Intermittent System Adopted.

The Goole Urban District Council have agreed to recommendations of a specially appointed Sub-Committee which will involve an outlay of £13,000 in connection with the gas undertaking.

The Sub-Committee stated in the report which was adopted that tenders received for the erection of new carbonizing plant, capable of producing 600,000 cubic feet of gas per day, had been carefully considered, together with plans and specifications; and they recommended that the tender be accepted of Messrs. Goodall, Clayton, and Co., Limited, for the provision and erection of an installation of vertical retorts on the intermittent system of the Vertical Gas-Retort Syndicate, Limited, at a cost of £11,263, and subject to the sanction and approval of the Local Government Board.

The Sub-Committee desired to record their unanimous recommendation of the intermittent system, for the following among other reasons: (*a*) Adaptability to the site, having regard to the ground space, compared with other systems; (*b*) increased guaranteed make of gas per ton of coals, being 2000 cubic feet per ton more than any other tender, which is equivalent to a saving of 1100 tons of coal per annum, equal to £715; also increased yields of bye-products of excellent quality; (*c*) simplicity of construction and operation, with no complicated mechanism requiring frequent attention and repair; (*d*) considerable saving in labour costs; (*e*) makers guarantee completion within less time than other tenderers; (*f*) guaranteed results warrant additional initial outlay; (*g*) this system does not involve the demolition of existing plant, which would be the case if through horizontals were erected. The repayment of principal and interest involved in the proposed scheme of £13,000 would, they said, be approximately £1174 for the first two years, being the period allowed by the Local Government Board for repayment of loans in respect to retorts; while after such period the sum would be reduced to £909 per annum. The estimated annual saving with the proposed new system, as against the existing conditions, would be: Saving in coal (2700 tons at 13s. per ton), £1750; labour, £980; total, £2730. Taking the repayment of principal and interest for the first two years at £1174, it would mean an actual saving of £1556 per annum; and after the first two years, when the cost of the retorts would have been repaid, it would be £1821. The estimated cost of retorts was £500, the annual repayment for which, extending over two years, would be £265.

THE LIGHTING RESTRICTIONS IN SOUTH LONDON.

At a Meeting of the Balham and Tooting Traders' Association on Friday last, Mr. Albert Stokes, the Chief Inspector of the South Metropolitan Gas Company, explained the Company's reason for charging shopkeepers half the usual amount for rent and maintenance of high-pressure gas-lamps, in spite of the enforced obscurity. He said the Company had spent £70,000 in South London in establishing the high-pressure lighting system, and they could not meet the loss of £1100 a month on the system by raising the price of gas to the thousands of private consumers, because it would not be fair. So long as the diminished lighting order was in force, the Company were only charging traders one-half of the cost of the rental and maintenance, which, he considered, was not only fair and reasonable, but was barely paying the cost of the upkeep of the lamps.

Mr. H. Prince asked whether the Company had a great deal more business in interior lighting.

Mr. Stokes said that this had by no means recouped their loss.

Mr. G. Doland paid a high tribute to the Company in regard to their past associations with customers. They had often gone out of

their way to act in a sportsmanlike manner; but he could not say they had handled the present position in their usual fashion. In the communication which he had received, they said that the cost of upkeep had been barely charged. He maintained this assertion could not be sustained, in comparison with the charges made by other companies in the present unprecedented circumstances; and he, for one, objected to pay the charges made. In Birmingham no charge was being made. The Wandsworth, Wimbledon, and Epsom Company were charging nothing; while at Ealing the Borough Council were keeping up the electric arc lamps, and charging only for cleaning them. In the great majority of cases no charges were being made by the companies, while the lamps were not in use except for cleaning once a week, in order that the lamps could be re-lighted directly the restrictive order was removed.

Mr. W. A. RABSON said the South Metropolitan Gas Company stood alone, he believed, in making this charge.

Mr. PRINCE pointed out that if it was illegal to charge the whole cost of the rent and maintenance it was illegal to charge part of it. He should refuse to pay it; and he would support all traders who took a similar course.

Mr. STOKES, in reply, said that he had attended many other meetings of traders' associations in South London, and in almost all cases they had agreed unanimously that this was a very fair charge to make. The Company had no funds at their disposal to enable them to give the generous treatment suggested. He pointed out that one serious loss the Company would have to face was that the contracts were based on the old rate of mantles; but the price of these had now gone up 130 per cent. He asked the traders to trust the Company in the future, as they had done in the past, and he could promise they would be treated in a generous spirit. Their views would be laid before the Directors, and would receive full consideration.

At a Meeting of the Battersea and Clapham Junction Traders' Association, the Secretary (Mr. C. J. Allpass) reported that he had written to the Town Clerk of Battersea with regard to the proposed reduction of 60 per cent. in the charges for maintenance of electric lamps outside shops. He had expressed regret that traders were not treated in a more businesslike manner by the Council. As a result, it had been arranged that a deputation from the Association should be received by the Electricity Committee. He added that he had written to the South Metropolitan Gas Company pointing out that the Company's proposal with regard to unused high-pressure gas-lamps amounted to a reduction of about 70 per cent.; but the Association noticed that the Gas Light and Coke Company, who served part of the district, were charging nothing while the lighting order remained in force. He had received a call from the Chief Inspector of the South Metropolitan Gas Company, who explained that the two concerns were in different positions.

Mr. G. W. ROCHE said they were quite satisfied until they saw what the Gas Light and Coke Company were doing. Messrs. Taylor and Willcocks, the Solicitors to the Association, had replied to their inquiry as to the law on the subject. Their opinion was that the Borough Council were entitled to succeed in their position, as they were actually supplying what they contracted to supply—the installations. A different opinion, however, would be arguable.

Mr. R. T. PROUDFOOT said he thought that the effect of the Government's stepping in was to nullify the contract. The increase many shopkeepers were making in their inside lighting meant profit for the Company in the days to come.

The matter was adjourned until after the Association had waited upon the Borough Council.

At a Meeting of the Battersea Borough Council, attention was drawn to an item in the accounts of £2081 3s. 9d. credited to the Council for electric lighting in the streets.

Mr. BRIDGE said the Council, as the largest customer of their own electricity works, ought to examine the accounts very carefully.

Mr. HEYTHORNWAITE said the price for gas for street lighting had been reduced; but the Council were still paying the Electricity Committee the full price. Was there to be no reduction while light was lacking? Tradesmen were paying for outside lighting, and were getting none.

Mr. BROGAN said that, until the accounts came in, they were unable to say whether they could grant any reduction. The expenses of the undertaking were the same. Less coal was purchased; but this was more than counterbalanced by the increased cost. The Council were not a penny in pocket by the reduction in street lighting.

At a Meeting of the Lambeth Borough Council, the Lighting Committee reported that they had had submitted to them the account of the South Metropolitan Gas Company for the last quarter, amounting to £2522, and also a detailed statement prepared by the Company showing a saving of £573 to be remitted from this amount in respect of unused gas, in consequence of lamps put out of lighting by order of the Commissioner of Police. The Company stated that an allowance could only be made in respect of unused gas, as the cost of maintenance, &c., was as heavy as when all the lamps were in regular burning. The Finance Committee had passed the account for payment.

Alderman EVANS considered the account was very unfair, as they had not had a quarter of the street lighting that they had in normal times. The allowance was totally inadequate.

Mr. BRAGGE remarked that all the lamps had to be kept in thorough order, as they were lighted on different nights.

Mr. BASCOMBE, the Chairman of the Lighting Committee, pointed out that practically the Council had no power over the street lighting at the present time, and had only to obey the orders of the Admiralty and the Chief Commissioner of Police. He thought the rebate by the Company was an extremely liberal one.

The reports were then adopted.

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SOUTHPORT GAS AFFAIRS.

At the January meeting of the Southport Town Council held last Tuesday, several matters were raised and discussed before the minutes of the Gas Committee were ultimately confirmed.

Mr. O'REGAN, upon the minutes being moved and seconded for adoption, drew attention to one stating that "the Gas Engineer reported that he had purchased several lots of coal." He protested against this method of purchase, and asked if the Contracts Committee appointed by the Gas Committee were not competent to buy coal. He also referred to a minute stating that the Chairman had accepted a tender for 50 tons of sulphate of ammonia, and complained that they never knew what it had been sold for. Then he called attention to an item of wages amounting to £2100. The Council were told, he said, when they invested £16,000—which grew into £21,000, he believed—in vertical retorts, that wages would be reduced. In 1912, the wages were £1080; in 1913, £1840; in 1914, £1831; and now they were £2100. It showed that, instead of saving £4000 in wages, they were losing.

Alderman DUERDIN: What is the increase in the make of gas?

Mr. O'REGAN said he believed the receipts last year were £20,000; but this was not at all in proportion to the outlay of £20,000, which was supposed to result in £4000 saving in the cost of labour. He noticed some subscriptions which, having regard to the position in which the country was at the present time, the Council could well afford to give up for this year.

Mr. DUCKWORTH, mentioning the minute with reference to sulphate of ammonia, said tenders were received and the highest offer was accepted. Commodities of this nature were fluctuating very considerably; and the Committee unanimously gave the Chairman and the Engineer full powers to accept emergency offers. So far as the lots of coal were concerned, the offers did not come before the Contracts Committee, but before the whole of the Gas Committee. They then recommended him to accept some of the offers, subject to the tests proving satisfactory. The tests proved satisfactory; and the Engineer (Mr. John Bond) purchased the coal. Referring to the point raised about the retorts, he pointed out that they were making more gas, and had fewer men engaged at Crowlands; but it was one thing producing gas and another thing selling it, and encouraging the selling of it. Where the wages were going up, at the Eastbank Street depôt, they were getting very good results. In less than two months they had sent out a matter of over 400 gas-fires. This was why the wages bill was not going down as they might expect. As for the subscriptions, he maintained that it was a matter of advertising; and £100 was not too much to spend on this.

Mr. RICHARDSON (the Chairman of the Gas Committee) also mentioned, with regard to sulphate of ammonia, that they were dealing with a fluctuating market, which had recently been very low. What had been done was a business way of dealing with the question. They were going to use their discretion about this matter, and do the best they could for the undertaking. He took it the Gas Committee and the Council would support them. As to the purchase of coal, this was made at 6d. a ton less than usual. The ordinary supply of coal was short, because the collieries were not delivering as readily as they did before the war. The subscriptions he thought were well worth the money for the return they got. The British Commercial Gas Association issued a lot of literature. Referring to the question of vertical retorts, he said they had been a huge success.

GAS AND ELECTRICITY AT WALSALL.

A good deal of time was spent by members of the Walsall Town Council at their meeting last month in discussing the lighting of a new road. The Streets Committee recommended that this should be by means of gas, the terms for which certainly had every appearance of being far more advantageous than those offered for electricity. However, the Chairman of the Electricity Committee thought his department should have more street lighting; and on his initiative an amendment was carried referring the matter to the General Purposes Committee for further consideration. Last week the Committee (which comprises the whole Council) reported that they had reversed the decision of the Streets Committee, and had determined that the road in question should be lighted by electricity. Thereupon there was some further lengthy discussion.

Mr. OSWIN (the Chairman of the Streets Committee) moved an amendment reversing the decision of the Council in committee, and reverting to the original proposition to light the street with gas. He contended that the Council, at their private meeting, missed the really important point, which was whether the best results could be obtained from gas or from electricity, and simply discussed the question from the point of view of departmental interests. The experience of Walsall was that for street lighting purposes electricity was not a satisfactory illuminant; and before the Streets Committee could extend its use, they must be satisfied that the Electricity Committee could give an efficient and reliable light. In this instance, the Gas Committee offered to maintain lights of 320-candle power at almost as low a price as the Electricity Committee quoted for 150-candle power lights; and the latter also wanted a guarantee that a supply would be taken for fifteen years.

Mr. THOMAS seconded the amendment, on the ground that the Council ought not to interfore with the discretion of the Streets Committee.

Mr. HAYWARD (the Chairman of the Electricity Committee) contended it would be ultimately in the interests of the ratepayers to extend the lighting of the streets by electricity, and said at present the Gas Committee had almost a monopoly of public lighting. The Electricity Committee proposed to show in this new street what could be

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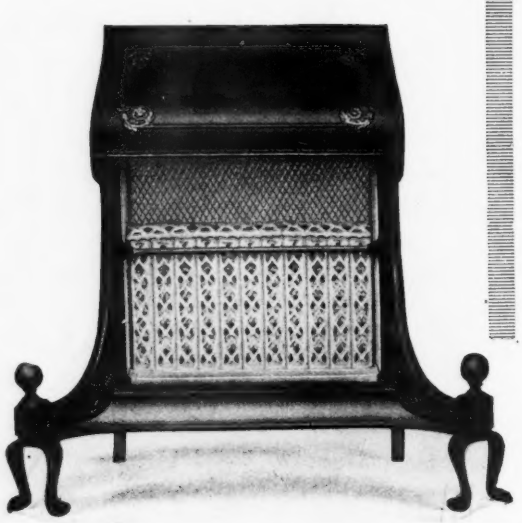

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done in the way of public lighting; and they would not be content until they had control of the whole street lighting of the town.

Mr. LESTER said this rivalry between municipal trading departments was calculated to have most unfortunate results from a ratepayer's standpoint, as the present tendency was to get customers at any price. The wisest policy the Council could pursue would be to vest the management of both concerns in one Committee.

Mr. VENABLES (the Chairman of the Gas Committee) urged that electricity had proved a failure wherever it had been tried for street lighting.

Sir E. T. HOLDEN, in the course of some remarks, said his experience was that gas gave a better light at one-half the cost.

Dr. LYNCH, on the other hand, said the Council had a large sum invested in the electricity works, and ought to give the undertaking a fair chance.

The amendment was defeated by fifteen votes to twelve; and the report was then approved.

SHEFFIELD CORPORATION BILL WITHDRAWN.

An Agreement with the Derwent Valley Water Board.

A proposal was contained in the minutes of the Water Committee adopted at last Wednesday's meeting of the Sheffield City Council, that the Corporation Bill for amending the Derwent Valley Water Act should be withdrawn. The object of the Bill was to amend section 85 of the Water Act, with respect to the apportionment of the expenses of the Derwent Valley Water Board, and for the setting aside of any award or other proceeding so as to give effect to such amendment.

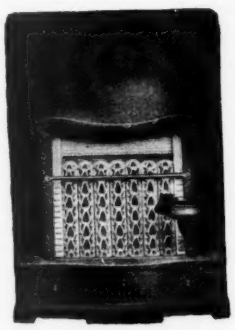
Alderman STYRING, explaining the terms which had been arrived at with the Board, said that, but for the free hand which the Council gave the Water Committee to promote a Bill, there would have been no compromise. They, no doubt, made considerable impression on the minds of members of the Board by their action in Parliament last summer; but unless they had pushed the matter further, they would not have been able to effect any settlement. The questions in dispute between the Board and the Corporation were three. The first related to the obligation of Sheffield to contribute to the cost of the land below Lady Bower, on which was constructed the aqueduct for the supply of water to Nottingham, Derby, and Leicester; the second referred to the construction of a reservoir at Ambergate; and the third to administration expenses. The Council would possibly be surprised to hear that the accumulated administration expenses up to the end of 1911, when they had first to begin to make precepts on the various constituent authorities, amounted to £87,000, in addition to interest on the money which had been borrowed to provide these expenses. As to the first two items, the Corporation had been obliged to give way. On the other hand, their claim with reference to the administration expenses and interest was conceded. The figures were to be gone into by officials of the Board; but it was generally believed that the saving to Sheffield would be £500 a year. The differences between Sheffield and the Board were now at an end, and harmony was restored. He thought the compromise was fairly satisfactory to all parties. It must be remembered that the Board were in a very strong position, as they had secured the decision of the Arbitrator in their favour on all three points; and this decisien had been confirmed by a Court of Law. They had the law on their side; but for the sake of peace, they had conceded the important question with reference to administration expenses. He thought the Corporation and the Committee were to be heartily congratulated on the conclusion that had been reached.

Sir WILLIAM CLEGG thought something should be said to show the marked appreciation of the Council of the services of the Chairman of the Water Committee (Alderman Styring) and the General Manager of the Water Department (Mr. W. Terrey), in arranging terms with the Board, and thus preventing a very expensive parliamentary fight. Since the question was raised by Sheffield it had caused a good deal of apprehension among the members of the Board; and they were exceedingly anxious some means should be found of preventing friction between the two bodies. Owing to the diplomatic manner in which the Chairman of the Water Committee and Mr. Terrey had approached the matter, a satisfactory solution of a very difficult problem had been reached. Of course, Sheffield had not got all they claimed they were entitled to; but, on the other hand, the Water Board considered they had made very substantial concessions for Sheffield. Not only had they a satisfactory settlement, but they had done what, in his opinion, was more satisfactory—they had restored the very friendly relations which had always existed between the constituent authorities of the Board, which was worth a very great deal. The members of the Board appreciated the fact that they had been able to come to this very satisfactory compromise, and also appreciated the knowledge that Sheffield was now in entire harmony with the government of the Derwent Valley water undertaking.

Alderman CATTELL also paid tribute to the ability with which the Chairman of the Water Committee and the General Manager of the department had conducted the business.

A formal resolution for the withdrawal of the Bill was carried.

Bourne Gas Undertaking.—The Bourne Urban District Council have completed arrangements for the purchase of the undertaking of the local Gas Company, and for borrowing money for the purpose, upon terms which represent the possibilities of a remunerative bargain; it being reported by the Clerk at the last meeting that he had raised the necessary loan, the major portion of which (£13,353) would be for thirty years, at 4½ per cent.



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(*Extract from the "Lancet," Nov. 14, 1914.*)

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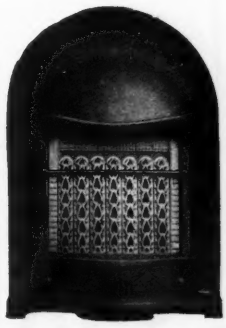

The "RATCLIFF."

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The new gasholder erected by the Gourock Town Council, at a cost of about £3500, was formally put into operation last Tuesday. It has a capacity of 134,000 cubic feet, and it is estimated that it will be sufficient to supply the town for the next eighteen years. Ex-Bailie Dixon, the Convener of the Gas Committee, turned on the gas from the holder to the town in the presence of a gathering, including representatives of the Town Council, the contracting firm (Messrs. Clayton, Son, and Co.), and the Consulting Engineer (Mr. John Gillespie, of Glasgow). The company were afterwards entertained at luncheon.

According to the last quarterly report of the Gas Engineer and Manager of the Motherwell Corporation (Mr. Alexander Mackay), the undertaking which they have lately acquired is in a flourishing condition. The receipts for gas showed an increase of £367; and though the country is passing through a very trying period, the accounts were paid up much better than last year—those outstanding being £300 less. The amount of the profit balance for 1914 was £1940, compared with £1880 for the preceding year—showing an increase of £60. The profit at the end of the first quarter was £1552, and this added to the second quarter's profit of £1941 makes a gross profit of £3493 for the six months. From this has to be deducted the interest paid at the Martinmas term, which amounts to £1557—leaving a net profit of £1936.

Two other matters in connection with Motherwell gas affairs may be mentioned. The Income Tax Commissioners recently heard an appeal by the Gas Committee in regard to the claim that depreciation of £1452 should be allowed. After hearing the authority for the claim and the Assessor's reasons for not allowing depreciation in respect of wear and tear, the Commissioners decided in the Committee's favour, and allowed the whole amount claimed. This represents an actual saving of £76 13s. 6d. A proposal was contained in the Gas Engineer's report recently submitted to the Town Council in connection with the cutting-up of footpaths and streets. As a result of the proposal the Council have agreed that a report should be submitted to the Burgh Surveyor at a fixed date each year by the Gas, Electricity, Water, and Drainage Committees, as to their probable street openings during the succeeding twelve months. On receipt of these reports, the Burgh Surveyor will report to the Streets Committee on the whole matter, and arrangements will be made to prevent unnecessary expense and inconvenience in the reopening of streets and footpaths.

In the "Notes" in the "JOURNAL" a fortnight ago, reference was made to the dissatisfaction shown by members of the electrical trade in Edinburgh to the proposal contained in the Provisional Order for which the Corporation are applying, under which they will be enabled to open show-rooms for the loan of electrical motors, flat-irons, &c. The subject was under discussion at the monthly meeting of the Merchants' Association last Thursday, when a deputation attended from the Edinburgh branch of the Electrical Contractors' Association of Scotland. Mr. Walter Finlay, the Secretary to the electrical trades, said that hitherto the Corporation had not transgressed beyond their proper sphere in regard to their electricity undertaking; but if they began to provide electrical energy and fittings in a small way, it might grow, as the gas undertaking had grown, to the prejudice of the traders. He took the clauses of the Order to mean that the Corporation would be able to sell motors and fittings and do wiring work; and this was exactly what the contractors had to do. No industry could exist under the terms contained in the Order. Members of the Corporation said their purpose was to do hiring business and have show-rooms. The trade already did hiring and had excellent show-rooms. He was convinced that if the Corporation opened show-rooms throughout the city the private ones would all have to shut up; and if this happened enterprise in the trade would undoubtedly suffer. Mr. Stevenson, the Convener of the Electric Lighting Committee, said their proposal, as business men, was to obtain powers to hire-out fittings and other apparatus, and use their funds in providing show-rooms, but not to sell anything or to do any wiring. They were surprised, therefore, when the electrical trade came in opposition. He thought they would have received the proposals with open arms. He was convinced that there was a great future for hiring in Edinburgh; but people would not hire from the individual trader. He could not imagine that the Committee would ever use their powers as Mr. Finlay had suggested. The result of the clauses would be that there would be such an impetus to the electrical trade that the men who now opposed the undertaking would become its greatest supporters.

An inlet gas-main which has been in operation for thirty years has been fractured at the Penicuik Works, with the result that the town was in darkness. The main entered the gasholder, and it was a matter of difficulty to get it repaired, particularly as the works were flooded with water from the tank,

Scottish engineering firms are now entering upon a busy period. Both the home and export trade are improving, though Colonial orders are slow in being given out. The tube companies are now finding both home and export orders coming to hand. Navy and War Office work is well in evidence; but for a few months past, unless for urgent contracts, the general trade has not been active. The Scottish Tube Company, Limited, whose head office is in Glasgow, are manufacturing large quantities of gas-pipes; and they have in view an influx of Colonial orders. This amalgamation comprises eight large companies with ten works. Messrs. Stewarts and Lloyds, Limited, who not long ago erected two works for the manufacture of the smaller sizes of tubes, supply thousands of tons of iron and steel gas-pipes. At present Admiralty and War Office orders necessitate pressing work, and in future the Colonies and South America are looked forward to.

A new type of steam road-waggon has just been supplied to the Gas Department of the Glasgow Corporation. It can carry 4 tons, and is rubber-tyred. It is fitted with a three-compartment body, each division holding a ton of coke. The floors are sloped, so that one of the com-

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partment discharges to the right, another to the left, and the third to the rear. The vehicle has been constructed by Messrs. Alley and M'Lellan, Limited, of the Sentinel Works, Glasgow. Fully eight years ago the Gas Department purchased from the Company a 6-ton steel-tyred waggon, and fitted it with a four-compartment body.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 18.

The position of pitch remains unchanged. The price is nominally 25s. per ton or a little over, but the constantly increasing freight rates before referred to make business practically impossible. Creosote continues firm at 4d. to 4 1/16d. per gallon. Other products remain unchanged.

Sulphate of ammonia continues to improve. For 25 per cent. quality, £12 7s. 6d. per ton net and naked at works is a fair value for prompt, and it is stated that a rather higher equivalent has been obtained in the North. For the second half of the year, £11 15s. per ton was done a little time back, and there were further buyers at the same figure, but makers now require a premium.

Tar Products in the Provinces.

Jan. 18.

There is no material alteration in the markets for tar products. In benzol, the price remains about the same, but there is not very much new business. Owing to the control being practically taken over by the Government, there is not much to report concerning toluol. Creosote keeps steady, though one or two lower prices have been mentioned in some quarters. The crude carbolic market remains fairly steady, though there has been more offering for the January-June position. Solvent and heavy naphthas are steady, and a good many contracts are reported in these articles.

The average values during the week were: Value of liquid products in one ton of tar, 17s. to 18s. 6d. Benzol, 90 per cent., naked, North, 8 3/4d. to 9 1/4d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. to 2s. 4d. Crude naphtha, in bulk, North, 5 1/4d. to 5 3/4d. Solvent naphtha, naked, North, 11 1/2d. to 1s. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3 3/8d. to 3 7/16d. Heavy oils, in bulk, 4d. to 4 1/8d. Carbolic acid, casks included, 60 per cent., East and West coasts, 2s. 10d. to 2s. 11d. Naphthalene, £6 to £11; salts, 65s., bags included. Anthracene, "A" quality, 2d. per unit; "B," nominally 3/4d.

Sulphate of Ammonia.

LIVERPOOL, *Jan.* 16.

During the past week the tone of the market has continued to gather strength almost from day to day, and the pace of the advance has been accelerated. There has been a good demand from Spain, and home buyers have shown considerable interest, while dealers have apparently still had large commitments to cover. The closing quotations are £13 per ton f.o.b. Hull, £13 2s. 6d. per ton f.o.b. Liverpool, and £13 5s. per ton f.o.b. Leith, for early shipment. In sympathy with the near position, the price for forward delivery has also increased; and it is reported that first-hand business has been done at £13 per ton f.o.b. Liverpool over the first six months of this year.

Nitrate of Soda.

The market for this article is again somewhat firmer, and the values on spot are now 10s. 3d. per cwt. for ordinary quality and 10s. 6d. for refined.

Sulphate of Ammonia.

From another source it is reported that this market has remained very firm throughout the past week, and it is difficult to understand the position. Outside London, makes are quoted at £11 17s. 6d.; Hull, £12 12s. 6d. to £12 15s.; Liverpool, £12 15s. to £12 17s. 6d.; Leith, £12 17s. 6d. to £13; Middlesbrough, £12 15s. to £12 17s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is rather irregular; the high rates of freights and the scarcity of steamers making the coal shipments rather scanty. In the steam coal trade, some of the collieries seem to be well sold for prompt delivery, but want of ready tonnage is felt. Best Northumbrian steams are about 13s. 6d. per ton f.o.b., and up to 13s. 9d. per ton is asked in some cases. Second-class steams are from 11s. 3d. to 11s. 6d. per ton; while for steam smalls the market is firmer at 7s. 6d. to 9s. 3d. per ton, according to quality. For forward delivery, the prices asked are rather higher; so that with freights of record height, the cost of coal delivered is very great. In the gas coal trade, there is generally a good inquiry, though the local consumption will soon begin to decrease. Best Durham gas coals are now 12s. 4 1/2d. to 12s. 6d. per ton f.o.b.; second-class gas coals are near 10s. 10 1/2d. to 11s. 3d. per ton; and "Wear Specials" are 12s. 10 1/2d. to 13s. per ton f.o.b., with a fair delivery of the latter. A contract has been fixed for some 5000 tons of best Durham gas coals for the Christiania gas supply, and the price is believed to be 12s. 5d. per ton f.o.b. Some other small contracts are also in course of arrangement, and there are fairly good consignments on the long contracts. When, however, it is added that the rate of freight, Tyne to Genoa, is 38s. per ton, the difficulty of sales in that district is at once shown; but the strong demand forces some purchases. The coke trade is quiet on the whole. Gas coke is rather variable in price—from 11s. to 12s. per ton f.o.b. being quoted, according to quality.

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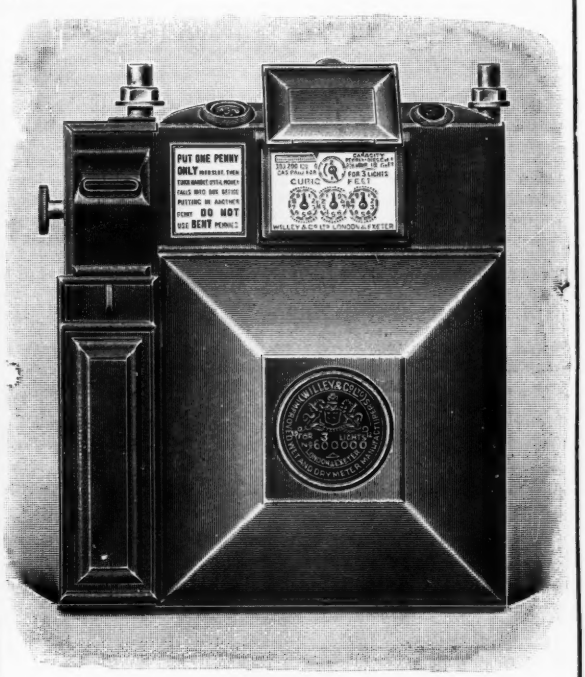

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D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Increase in Price at Torquay.—The Torquay Gas Company have increased the price of gas to ordinary consumers 4d. per 1000 cubic feet, and have reduced the discount to the slot-meter consumers from 3d. to 1½d. in the shilling.

Gas Complaints at Lytham.—According to the minutes of the Lytham Gas Committee, the report of the Gas Manager (Mr. A. Halliwell) showed that gas was being sent out of an average illuminating power of 17·83 candles; and noting this, it comes as a surprise to see that at a meeting of the Council last Thursday week there was some grumbling at the quality. Reading through the report of the proceedings, however, it is gathered there is a feeling that further provision for purification is required, but "the Committee do not see their way to grant it." One member said he hoped the Chairman "would back the Manager up, and make things better by-and-bye;" while the Chairman of the Committee retorted that he had never told Mr. Halliwell to do anything since he had been Chairman. It was a question of fuel; and, he added, "there never was a gas-works in the world that never went wrong—the purifiers go wrong and get clogged up."

Electricity Scheme Proposed for Bodmin.—At a meeting of the residents at Bodmin held last Wednesday, Dr. Purvis delivered an address on the subject of having an installation of electric lighting in the town. He said he thought that for an expenditure of about £5000 a scheme could be introduced. In towns similar to Bodmin as regards population and area, where electric light systems had been installed by local companies, they were all paying good dividends. He was certainly of opinion that, if economically conducted, the chance of a company paying in Bodmin would be exceedingly good. There were two ways of carrying out the scheme—one being for the local authority (in the case of Bodmin the Town Council) to instal the electric light as a municipal undertaking; and the other by forming a local limited liability company. He suggested that those present should form themselves into a committee to go into the question more fully. It was decided to hold another meeting to consider the matter further.

Water Charges at Worcester.—As the result of negotiations between the Water Committee and local manufacturers, the Worcester City Council have decided that, as from April 1 next, the charge for metered supplies of water shall be 7d. per 1000 gallons up to 250,000 gallons in any quarter, and 6½d. per 1000 gallons in excess of this quantity.

The Increased Price at Newcastle.—Some reference was made at last week's meeting of the Newcastle City Council to the increase of 2d. per 1000 cubic feet which the Newcastle and Gateshead Gas Company have had to make in the price of gas. Mr. Barker expressed the opinion that the Council should place on record their resentment at the unpatriotic action of the Gas Company in raising their price at the present time; and Mr. Jackson, while admitting that the price of everything was bound to go up as the result of the war, complained both about the pressure and the quality of the gas. Mr. George Lunn, however, remarked that he was satisfied with the explanations given by the Company as to the causes of the increase. The fact that the Company are dealing well with employees who have enlisted, by paying full wages during their absence, was emphasized by Alderman Wilson.

An Increase in Price at Bognor.—The Bognor Gas Company have felt themselves compelled, along with many similar undertakings, to make an increase in the charge for gas for public and private lighting. The addition made is not a very great one in the circumstances—no more than 2d. per 1000 cubic feet; but the Council, on the recommendation of the Special Purposes Sub-Committee, have decided to make a formal protest to the Company "against the raising of the price without giving longer notice to consumers," and to inform the Company that the Council will refuse to pay any increase in the price of gas for public lighting. One member stated that the day after the notice appeared in the paper the price was increased; but another pointed out that, while the Company were now paying 5s. more per ton for coal, they were only charging the consumers 1s. 8d. extra per 10,000 cubic feet of gas.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had what may fairly be regarded as a satisfactory week. It has not been a period of rapid and sensational advance, but one of steady and progressive development that gives better assurance of solidity in its upbuilding. The new rules are working as well as should be expected from novel conditions outside all living experience—perhaps even better than was anticipated. Difficulties and awkward points will, of course, from time to time crop up and require judicious handling. But, to quote a Chinese proverb, "With time and patience the mulberry leaf becomes silk." A favourable sign was the augmentation in the volume of business actually done, and the progressive firmness of several important markets. In some of these, indeed, the extent of transactions was only limited by the paucity of stock; sellers not being numerous enough to accommodate all the intending buyers. Conspicuous among these were the War Loan, Home Rails, and several choice Colonial issues.

Business in gas securities showed increased activity and a hardening tendency in prices, especially Gas Light and Coke issues, which were in good demand. The bargains done for cash during the week were as follows: On Monday, Commercial 3½ per cent. 98½, Gas Light ordinary 88¼, 88⅞, 89¼, 90, Imperial Continental 81, 82, 83, South Metropolitan 100, ditto debenture 70¼. On Tuesday, Gas Light ordinary 89, 90, 90⅛, ditto preference 93¾, South Metropolitan debenture 69, 70. On Wednesday, Croydon 223, Gas Light ordinary 89⅛, 89⅜, 90, 90⅛, ditto maximum 73½, 74, ditto preference 93, 93½, Hastings 89, 89½, Imperial Continental 82, 82½, South Metropolitan 100, Tottenham "B" 113, 113¼. On Thursday, Gas Light ordinary 91, 91⅛, South Metropolitan 100, 100⅜, 101¼, South Suburban West Kent 92. On Friday, Brighton and Hove ordinary 145⅜, 146½, British 42¼, Croydon 224, Gas Light ordinary 90, 90⅛, 91, 91¼, 91⅛, ditto maximum 70½, 72½, 73½, Imperial Continental 82⅜. On Saturday, British 42, Gas Light ordinary 90⅜, 91, 91⅛, 92, ditto preference 92⅜, 93, South Metropolitan 101⅛, ditto debenture 70, 70⅛. It may be noted that the dividend paid on the South Suburban West Kent (now for the first time quoted) was at the rate of 5⅛ per cent. On their respective local Exchanges, Newcastle and Gateshead was quoted 96⅛–97⅛, and Sheffield 212-216, but in neither was business marked. In the Money Market, there was extreme ease both for short loans and discounts.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 4½ per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JANUARY 16.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.*	Lowest and Highest Prices of Bargains.
£			p.c.		£ s. d.		
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59–64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd.	5⅞–6⅜	5 17 8	..
50,030	10	Feb. 26	16	Bourne- mouth Gas and Water } B 7 p.c.	29–30	5 6 8	..
378,480	10	,,	7		15–15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13¾–14	4 5 9	13¼–13⅜
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	5 5 3	..
330,000	,,	,,	11	Do. New	204–209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk.	154–159	5 0 8	145½–146½
530,000	20	Mar. 26	12½	British	44–45	5 11 1	42–42¼
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1⅛–2⅛	—	..
100,000	10	—	—	Do. 4½ p.c. Pref.	4–6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70–75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	103–110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	5 1 2	..
560,000	,,	,,	5½	Do. 3½ p.c. do.	103–105	5 1 6	98½
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½–71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76–79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	5 18 8	..
—	—	—	—	Croydon B 7 p.c.	..	—	223–224
492,270	Stk.	—	6	Derby Con. Stk.	123–125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102–104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	17½–18*	5 11 1	..
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke } 4 p.c. Ord.	98–102	4 15 6	83½–92
2,600,000	,,	,,	3½		3½ p.c. max.	76–79	4 8 7
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96–99	4 0 10	92½–93½
4,674,850	,,	June 11	3	Coke } 3 p.c. Con. Deb.	72½–74½	4 0 6	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	5 12 4	83–89½
70,000	10	April 29	11	Hongkong & China, Ltd.	16½–16⅝	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	..	—	165
131,000	Stk.	Mar. 12	7⅛†	Ilford A and C	151–154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115–118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150–160	5 12 6	81–83
1,235,000	Stk.	Feb. 12	8½	Do. 3½ p.c. Deb. Red.	84–86	4 1 5	..
200,342	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	4 18 11	..
718,100	,,	,,	7	Do. B	146–148	4 14 7	..
806,083	,,	June 26	4	Do. Deb. Stk.	97–99	4 0 10	..

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.*	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛–4⅜	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne } 4½ p.c. Deb.	99–101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd.	11½–12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½–99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82–83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd.	117–122	6 11 2	118
60,000	5	Mar. 26	10	Ottoman, Ltd.	7⅛–7⅜	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B	128–131	4 19 3	..
100,000	50	,,	12	Do. C	118–121	4 19 2	..
249,980	5	April 29	8	Primitiva Ord.	5½–6	6 13 4	5–5⅜
499,960	5	June 26	5	,, 5 p.c. Pref.	4⅜–5	5 0 0	4⅛–4⅜
521,600	100	June 2	4	,, 4 p.c. Deb.	91–93	4 6 0	..
—	—	—	—	,, ,, 1911	..	—	85
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	4 12 0	..
150,000	10	May 14	6	San Paulo { 6 p.c. Pref.	10½–11	5 9 1	..
125,000	50	July 1	5	{ 5 p.c. Deb.	47–49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223–224	4 9 3	..
209,984	,,	,,	10	Do. B	222–224	4 9 3	..
525,500	,,	,,	10	Do. C	220–222	4 10 1	..
90,000	10	May 28	9	South African	10½–11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	4 16 8	100–101½
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½–74½	4 0 6	69–70⅝
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	5 3 5	108–109
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	4 9 3	..
—	—	—	—	Do. West Kent.	..	—	92
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord.	99–102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District { A 5 p.c.	135–138	5 8 8	..
742,275	,,	,,	6†	{ B 3½ p.c.	115–117	5 2 7	112–113½
181,255	,,	June 26	4	{ 4 p.c. Deb.	87–89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5–6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–109½	4 11 4	..
30,000	Stk.	Feb. 26	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151–156	5 7 4	..
255,636	,,	,,	6½	,, B 3½ p.c.	129–134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	5 2 0	..
352,000	,,	,,	6½	Wimbledon 5 p.c.	117–122	5 0 5	..
98,000	,,	,,	6⅜	Epsom 5 p.c.	121–126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66–69	4 6 11	..

* *Erratum.*—In last week's list this was erroneously stated as "Yield on Lowest Closing Prices."

An Agitation for "Recognition" at Cheltenham.—The granting some twelve months ago of an increase of wages to employees of the Cheltenham Gas Company has now been followed up by a demand on the part of the Amalgamated Society of Gas Workers and General Labourers for recognition by the Company. There were minor requests; but this was the main one, and the Company politely refused it. Thereupon a ballot was taken, and the men decided in favour of enforcing their demand by a strike. As a result, it is said, notices were handed in to terminate the men's services on the 30th inst. The men have been assured of the support of the Executive Council in their action; but "it is understood that every effort will be made between now and the 30th to avert a strike."

A Tribute to the Bodmin Gas Company.—Discussing the proposal for the establishment of electric light works in the town, the "Bodmin Guardian" pays a tribute to the Gas Company, which, it says, is very strongly entrenched, and has in recent years shown very decided enterprise. "It is one of the most go-ahead and successful companies in Cornwall," adds the newspaper, "and, speaking relatively it supplies gas to the consumer on about as cheap a basis as any in the country. There is no immediate prospect of the public lighting being done by electricity, for the Town Council have a contract with the Gas Company in this matter which has some two or three years to run." Having made these admissions as to the progressive character of the Company and the cheapness of gas, it is only natural that the newspaper should offer its support to the electricity undertaking, though it does not see how Bodmin is going to raise the capital required, or how the Company can be made to realize a profit if it should be formed. Whatever becomes of the enterprise, the "Guardian" seems anxious to be in the comfortable position of being able to say that it fully anticipated the result.

Lighting of a Plymouth Suburban Road.—The military authorities at Plymouth have taken in hand the lighting of the public road from the boundary of the borough to Crownhill, a district in which large barracks are situated. Several years ago the Plymouth and Stonehouse Gas Company laid a main to Crownhill; but the Local Authorities declined to incur the expense of putting up gas-lamps, although the road is much frequented. When the war brought a largely increased number of soldiers to the neighbourhood, the General commanding the fortress appealed to the inhabitants to erect lamps; but a parish meeting refused to incur the expense, and the road remained unlighted. Now the military authorities have given a contract for the carrying out of the work. The erection of lamps was begun last week by the contractor in conjunction with men employed by the Plymouth Gas Company.

The State of New York Public Service Commission (Second District) have provided for financing extensive improvements and new plant by the Ruckland Light and Power Company, by authorizing them to use the proceeds from the sale of $100,000 of 5 per cent. mortgage bonds for new gas-mains, service-pipes, meters, and connections, new electric distribution and service wires, additional land, &c.

Messrs. Brotherton and Co., of Leeds, have forwarded a desk calendar, bearing a portrait of Colonel E. A. Brotherton, in uniform. To each day there is appended an appropriate quotation; but none of them can be more appropriate to present circumstances than the one for the day on which the calendar was received—"Nothing great was ever achieved without enthusiasm." Seasonable and useful articles have also been sent by Messrs. Bale and Church, the firm of Andrew Stephenson, and Messrs. John E. Williams and Co.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

ENGINEER. Weston-super-Mare Gaslight Company. Applications by Feb. 8.
DRAUGHTSMAN. No. 5977.
TRAVELLER AS SALES MANAGER. No. 5979.
REPRESENTATIVE AND SUPERVISION OF OFFICES, &c. No. 5982.
MAINTENANCE SERVICE. Guildford Gas Company.
CLERK. Tiverton Gas Department.
CLERK (Brazil). No. 5983.
STOKER. No. 5978.
STOKER. No. 5981.

Appointment Wanted.

CLERK. No. 5974.
MANAGER, DISTRICT INSPECTOR, &c. No. 5980.

Gas-Works Wanted.

Particulars to "PRINCIPAL," Scripps's Advertising Offices, 13, South Molton Street.

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GASHOLDER AND TANK. Musselburgh Gas-Works.
IRON RETORTS. No. 5976.

Sale of Stock.

REDDITCH GAS COMPANY. Grand Hotel, Birmingham. Jan. 28.

Meetings.

SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel. Feb. 10. Two o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel. Feb. 12. Three o'clock.

TENDERS FOR

Lime.

SALFORD GAS DEPARTMENT.

Retort Settings.

WARRINGTON GAS DEPARTMENT. Tenders by Jan. 30.

Tar.

SIDMOUTH GAS DEPARTMENT. Tenders by Jan. 25.

Weighbridge.

AUDLEY URBAN DISTRICT COUNCIL. Tenders by Jan. 26.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1915 are reminded that this can only be done during the current month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

ADVERTISER seeks Position as MANAGER of small works, DISTRICT INSPECTOR, HEAD FITTER, or any POSITION OF TRUST. Has had good All-Round Practical Training in Gas Manufacture, Distribution, and Commercial routine of a Gas Company, City and Guilds Certificates, Engineering, Supply (Bronze Medallist). Married. Holds excellent References. At present in Charge of a 170 Millions Per Annum Distributing Station.
Address, No. 5980, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

CLERK (27) seeks Situation. Four Years' Experience in Distribution Department of an important Gas Company.
Address, No. 5974, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WESTON-SUPER-MARE GASLIGHT COMPANY.

THE Directors require the Services of a competent ENGINEER. He must take Entire Charge of the Gas-Works and the Mains and Services in the area of Supply, be capable of Preparing all Drawings and Specifications for Alterations and Extensions of Works and Plant, and give his whole Time to the duties of his Office.
Practical Experience in the Working of Modern Gas-Works, and of Electrically Driven Stoking Machinery, Elevators, and Conveyors essential.
Commencing Salary, £300 per Annum.
Applications, with *copies* of Two recent Testimonials, to be sent not later than the 8th of February, 1915, addressed to the Chairman of the Company, J. E. Norman, Esq., Gas Offices, 32, Boulevard, Weston-super-Mare.
By order,
T. W. LUCKHURST,
Secretary.
Gas Offices, 32, Boulevard,
Weston-super-Mare, Jan. 9, 1915.

WANTED, immediately, for a Gas- Works in Yorkshire, a DRAUGHTSMAN thoroughly conversant with Gas Apparatus. Temporary Employment only.
Apply, stating Age, Experience, and Salary required, to No. 5977, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED—a Traveller as Sales Man- AGER for Old-Established Firm of Manufacturers for General Gas-Works Plant, giving List of Principal Undertakings from whom orders are obtained. Salary £400, with £400 to £800 Commission. Two Out-door Assistants kept.
Apply, by letter, to No. 5979, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

OLD Established Meter Company re- quire the Services of a First-Class Man as CHIEF REPRESENTATIVE; also has Vacancy for Experienced MAN TO CONTROL OFFICES and TRAVELLERS.
Apply, by letter, stating Salary and Experience, to No. 5982, care of Mr. KING, 11, Bolt Court, Fleet Street, E.C.

WANTED—a Clerk for Gas-Works in North Brazil. Age 20 to 22 (Abstainer). Three Years' Engagement. Passage out and Home. Salary, £20 per Month. A knowledge of the manufacture and distribution of gas would be an advantage.
Apply, by letter, stating how employed, and enclosing *copies* only of Testimonials, to No. 5983, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, Clerk in Gas Department, Experienced in Rent Roll and General Accounts. Salary 30s. per Week.
Apply, with *copies* of three recent Testimonials, to J. SIDDALLS, Borough Accountant, TIVERTON.

WANTED—a Stoker, Good Shovel Charger, for 17 Million Works, with knowledge of Engine, Boilers, and Exhausters preferred. Must be Trustworthy and Willing. Permanent Situation to a Suitable Man.
Apply, by letter, Stating Wages required, to No. 5978, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

STOKER Wanted for Works near London. Good Shovel Charger Essential. Wages 35s. and good Bonus. Permanent Work for Reliable Man.
Apply, by letter, to No. 5981, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a Man for Main- TENANCE of INCANDESCENT BURNERS.
Send References with Age and Wages required, to the SECRETARY, Gas Offices, GUILDFORD.

ADVERTISER is prepared to Pay a Commission to anyone Introducing a SMALL GAS-WORKS that can be PURCHASED for Cash, where there is Scope for Development.
Particulars in Confidence, or write for interview to "PRINCIPAL," Scripps's Advertising Offices, 13, SOUTH MOLTON STREET, W.

GASHOLDER (4300 Cubic Feet Capacity) with CAST-IRON TANK FOR SALE. Apply to the GAS-WORKS, MUSSELBURGH.

FOR SALE, Cheap, Two 12½ in. by 12½ in. ⌂-Shape CAST-IRON GAS-RETORTS, 5 feet long.
Address, No. 5976, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

TENDERS are invited for the Supply of about 500 Tons of LIME required for the Purification of Gas.
Full Particulars may be obtained from Mr. WILLIAM W. WOODWARD, Engineer, Gas Offices, Bloom Street, SALFORD.

TENDERS are invited for One and, alternatively, for Two, REGENERATIVE SETTINGS of Eight Through Retorts 22 in. by 16 in. ⌂ by 20 ft. long.
Full Particulars on Application to the undersigned.
Tenders by Jan. 30, 1915.
W. S. HADDOCK,
General Manager.
Gas Offices, Warrington.

AUDLEY URBAN DISTRICT COUNCIL.

WEIGHBRIDGE FOR GAS-WORKS.

THE above Council invite Tenders for the Supply of a CART WEIGHBRIDGE for their Gas-Works, size 16 ft. by 8 ft., to Weigh up to 15 Tons, and to be fitted with Turnbox ends.
Further Particulars can be obtained on Application to the Gas Manager (Mr. J. Mottram), Gas-Works, Audley.
Tenders, endorsed "Weighbridge," to be sent to the undersigned not later than the 26th inst.
JOHN J. NELSON,
Clerk to the Council.
Kidsgrove, Staffs.,
Jan. 15, 1915.

SIDMOUTH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE above Council are prepared to receive TENDERS for the Purchase of Surplus TAR produced at their Gas-Works for the Year ending Dec. 31, 1915.
Probable quantity, 270 Tons.
The Tar will be Delivered free into Railway Tank-Waggons at Sidmouth Station.
Sealed and endorsed Tenders must be Delivered to the Clerk to the Council not later than Monday, the 25th of January, 1915.
The Council do not bind themselves to accept any Tender.
HY. BURGESS,
Engineer and Manager.
Gas Offices, Sidmouth,
Jan. 11, 1915.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at De Keyser's Royal Hotel, Victoria Embankment, in the City of London, on Wednesday, the 10th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December last; to declare a Dividend for the same period; and to elect Two Directors and One Auditor in the place of those Retiring by rotation.
The TRANSFER BOOKS WILL BE CLOSED from the 27th day of January inst. until after the Meeting.
By order,
F. McLEOD,
Secretary.
Offices: 709, Old Kent Road,
London, S.E., Jan. 16, 1915.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 12th day of February, 1915, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect two Directors and one Auditor in the place of those retiring by rotation; and for General Purposes.
Dated this 19th day of January, 1915.
The TRANSFER BOOKS WILL BE CLOSED from the 29th of January to the 12th of February, both days inclusive.
By order of the Board,
WILFRID WASTELL,
Secretary.
Offices and Works,
Lower Sydenham, S.E.,
Jan. 19, 1915.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 37, WALBROOK, E.C.